SCIENCE

FRIDAY, MAY 29, 1914

CONTENTS

MSS. intended for publication and books, etc., intended for review should be sent to Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE DAY OF THE EXPERT[1]

THE papers read before the American Association of Museums during the eight years of its life have covered a wide range of topics, reaching, one might imagine, the whole circle of museum interests. Yet there is one question, antecedent to all others, which has never been asked, and but once approached, in your presence. This is the question: Just what use are all these papers? We meet to develop and exchange our ideas; but when we separate, what power have we to put into effect what we have concluded and learned? We have the voice here. How much voice have we at home?

This question of official scope we share with every similar association; and with several it has recently become a burning question. Just a year ago there was formed an association of university professors for the determination and maintenance of professorial rights; and last winter the American Political Science Association and the Philosophical and Psychological Associations appointed committees to consider and report upon like matters.

A problem of problems like this offers appropriate matter for an initial presidential address; and its simultaneous agitation elsewhere suggests treating it in the broadest possible way—as a concern, not of one profession, but of all professions. Thus amplified, the topic becomes that of the present and future status of the specialist in the United States. Far as this theme stretches beyond the work of the permanent

[1] Presidential address, given at the ninth annual meeting of the American Association of Museums, held in Milwaukee, May 19–21, 1914.

public exhibitions we call museums, the inquiry into the day of the expert is one that vitally touches the whole official activity of every museum worker. The inquiry naturally divides itself into four:

What has been the position of the expert among us?

What change suggests itself?

What are the bearings of change?

What are the prospects of change?

We shall offer replies to these questions in succession: (1) by arguing that the prevailing attitude of institutions of the humanities in this country toward their expert employees is out of date; (2) by specifying a reform that would bring it up to date; (3) by meeting criticism of the new order; and (4) by noting its approach. We shall describe an outgrown condition, state and defend an adjustment, and report progress toward it. A glimpse of the past will lead to a glimpse of the future.

By expert will here be meant a person whose achievements demand special aptitudes long exercised; and by his day a time when these developed abilities are used to the best advantage of the community.

For the expert in this country, to-day, according to frequent remark, is not such a time; but there are signs that to-morrow will be.

Here and now, the work of the expert is largely carried on as a branch of corporate activity. Our men of science, pure and applied, our lawyers, doctors, educators, clergymen, social workers, artists and students of art, while they may practise their specialties alone, very commonly also serve some corporation, and in great numbers serve a corporation exclusively, as do most of us assembled here.

A corporation is a body of men empowered by the state to join in a certain purpose, and held responsible for its due fulfilment. At the end of his brief and hampered career as premier of England, Lord Rosebery is reported to have said: "Responsibility without power is hell." To be discharged successfully, duty must be coupled with corresponding authority. This is the foundation principle with which any study of the corporate sphere of the expert must begin.

A corporation engaging the aid of a staff is responsible at once for every detail of their action in its service, and for every detail of their outside life, in so far as this reacts upon their official activity; and hence possesses equivalent rights of control, subject only to law and custom.

Rights of total control presuppose in turn competence for total control. To ensure it, two methods of selecting the membership of a corporation are possible. In giving a certain purpose into the sole charge of certain persons, regard may be had either to the purpose chiefly, or to the persons chiefly; to their special competence, or to their general competence.

In the history of this country, the choice among men of the professions concerned was a colonial method; that among men of ability, however displayed, has been our national method.

The colonial method was an inheritance from the old world. Leonardo da Vinci is spoken of as the last European to take all knowledge for his province. With the development of the sciences and the arts after him, even men of commanding powers became specialists. Following the example of the mother country, the colonies placed their first colleges under the control of educational experts—in the main their clerics par excellence, or clergymen. An interpretation of the charter of Harvard College of 1636 given later by the colonial legislature, affirmed that the corporation was restricted to members of the teaching force; as the corporations of Oxford and Cambridge in

England still are. The charter of Yale College was issued in 1701 to ten clergymen, and provided that their successors should always be clergymen.

At the birth of our nation, the emphasis turned from purposes to persons, under the compelling force of two causes: the parity of our voting citizens, and the conditions of a new national life.

From the beginning of the new union one man was as good as another at the polls. Every vote cast was given the same weight. It followed that the recognition of the likenesses of men became dominant, and the recognition of their differences obscured. Leading men came to be thought of as like exponents of the sense and efficiency of the community. The acknowledgement of competence took the form of an acknowledgment of general competence. We of the United States have been nurtured in the belief that a man who has distinguished himself in any one direction will also distinguish himself in any other.

Our early national experience confirmed the belief at every turn. Pioneer conditions bring out the all-round man. The solid citizen in a new community is called on to be at once a farmer for sustenance, a manufacturer for clothing, a builder for shelter and a soldier for defence; often also a lawyer for justice, a doctor for the body, an educator for the mind or a teacher for the soul. The nascent civilization of the United States had its Leonardo da Vinci in Benjamin Franklin. Nor has our later progress yet thoroughly dislodged the ideal of the all-round American, fit for any task. The subjugation of a continent is in the main a business matter, and an able man may learn a business in all its branches. The practise of naming any capable person for any office has maintained itself among us because surpassing excellence has not for the most part been essential. We have fought successful wars with citizen soldiery and grown great in peace with practical men as intellectual guides. To Amiel our democracy announced an era of mediocrity; Schopenhauer called us a nation of plebeians; an Austrian royal visitor missed among us the sense of personality—the perception of that delicate but real differentiation that makes each man himself and no one else. This is the mark left on the society of the United States by our day of small things.

That day is now past; and it behooves us to examine the foundations of the emphasis which our methods of assigning responsibility impose upon persons instead of upon purposes, upon general repute instead of special fitness. When examined, our course proves an aberration from that of colonial times learned in Europe. We must go back upon history; but only to go on to a new social ideal which shall square at once with our political creed and our existing national conditions.

First, as to our political creed. The parity of voters obscures, but also implies the difference of men's capacity. In affirming that persons of a certain sex and reaching certain mental, moral and economical standards should be counted alike in the process of government, it presupposes others who do not possess these qualifications and are not to be counted at all. The conception of the equal distribution of capacity among men is negatived by the political device itself which fostered it.

It may be asked: What then becomes of the belief that men are created equal? If that renowned assertion does not mean that one man is as good as another, that all persons would show like capacity with like opportunity, what does it mean? Something totally different. Did it claim that every babe newborn might under favorable circumstances become what any other may, it

would seek to persuade us that males might become mothers. Instead of this and other absurdities but little less glaring, it proclaims the logical postulate that all real differences of human capacity are sensible facts of the present world. In Jefferson's glowing words, the inhabitants of this created frame bring none of their disparities with them from the invisible. There are no such things as divine rights, withdrawn from human scrutiny. The doctrine of equality affirms that only those persons who show themselves different should be treated differently. Its motto is the Roman challenge "*Aut tace, aut face*"—in modern American "Put up or shut up." True democracy is scientific method applied in politics. It accepts as inevitable in the political sphere also what Huxley called the great tragedy of science—"the slaughter of a beautiful theory by an ugly fact." The belief that a man who has shown exceptional powers in any one direction will also show them in any other is such a beautiful theory, exposed by our political creed to slaughter by ugly facts. Within narrow limits they confirm it. A capable farmer or efficient selectman will in all probability prove a good teacher of the rule of three, or a good postmaster. Beyond narrow limits they disprove it. Probably neither could teach Abelian functions well, or manage a wireless station. But whether verified or falsified, it is not the generalization itself, but the test of it, which is the sum and substance of the principle of equality. This is a doctrine of method, not a statement of results. It repeats in modern words the ancient injunction—"By their fruits ye shall know them." It is the merit system generalized. Admitting all verifiable disparities of human capacity, and excluding all mystic disparities, the equality of the Declaration is simple common sense. Denying them all indiscriminately, the equality of its interpretation is literally nonsense.

Second, as to our national conditions. They are no longer those of pioneer life. The task of leading the civilization of the United States has ceased to resemble a business. No man, however able, can learn it in all its branches. Growth, as is its wont, has developed heterogeneity from homogeneity. The arts we now practise have become as long as the lives we can devote to them. Our farmers, our manufacturers, our builders, our soldiers, our lawyers, our doctors, our educators, our religious leaders, are now different persons, each given wholly to his work. The era of the all-round man has at last gone by for us also, as centuries ago it went by for the old world. The excellence that comes alone from the long exercise of special aptitude is everywhere demanded, and the demand is everywhere being met. The era of mediocrity, the nation of plebeians, is on its way to bringing forth aristocracies of demonstrated ability, and the sense of personality—the recognition of that delicate but real differentiation that makes each man himself and no one else—will not long delay its advent.

The democracy of individuality, the democracy that accepts all proven differences and no others, is the new social ideal, squaring at once with the creed of our fathers and our own conditions. With our political creed, for the doctrine of equality, in denying all supersensible differences, stops short at the sensible world. Personality is its presupposition. With our national conditions, for the all-round man is bested in every line by the exceptional man in that line, and only the best has become good enough for us. The Jack-of-all-trades is master of none, and our progress calls for masters everywhere. Finally, the democracy of individuality makes for the union

in which there is strength. The new ideal is not that of a society of persons increasingly like each other, and hence increasingly sufficient each to himself, but of persons increasingly different each from the other, and hence increasingly necessary each to the other. While the Declaration proclaimed our independence of other peoples, it assumed our interdependence among ourselves. A citizenship of similars is like the sand, composed of particles each as complete as any and with no tendency to cohere; and a political house built upon it will fall. A citizenship of dissimilars is like the rock, composed of particles supplementing and cleaving to each other; and a political house built upon it will stand.

But we have not yet acquired the courage of our fundamental political conviction, nor yet thoroughly adjusted ourselves to our larger life. The administration of collective enterprises in the United States is at present in a state of unstable equilibrium. The question of the corporate sphere of the expert is not yet settled because not yet settled right.

While the actual fulfilment of corporate purposes has in general grown beyond the competence of any but those of special aptitude long exercised, our national habit persists of placing these purposes in charge of men of ability however displayed. Any conspicuous success, especially financial success, opens the way to a position of corporate authority. The necessary result is a permissive system of control. A corporation among us executes its trust by choosing paid assistants of the special ability required, and permitting them to carry out its purposes more or less in their own way. This situation of power perforce in abeyance is one of unstable administrative equilibrium. What is permitted can also be forbidden, and may at any time be forbidden by an authority alive to its responsibility and conscious of its power. In this event two rights to control come into conflict: the right based on capacity and the right based on law. The uncertainty of the situation is plain in the case of institutions of the humanities. Only an Orientalist can determine what antecedent study should be demanded for a course in the Vedas, only a technician whether quaternions should be used in teaching engineering, only an experimenter when a culture should be transferred from sun to shade, only a librarian what system of shelf numbering is applicable to fiction, only a surgeon how to conduct an operation in tracheotomy, only a religious leader to what spiritual exercise to invite a soul in need, only a curator how to install an ecological exhibit or make a collection of prints tell on the public, only an alienist how to control *melancholia agitans*, only a social worker how far the same methods of help are fitted to Syrians and Chinese. Yet others make up the boards on whose responsibility, by whose authority, and at whose option such decisions are taken. The permissive system settles the question of the corporate sphere of the expert but temporarily; leaving competence subject to impotence. It presents a problem, and one only to be solved by the union of the two potentially opposing rights. In the end, capacity must be given a legal standing. The skill demanded of the employee must be represented among the employers.

In contrast with the permissive system of control, that exercised according to this conclusion by a mixed board may be called the positive system. The terms refer respectively to the power of veto and the power of fiat. The positive system proposes that a corporation shall be constituted with a competence as all-embracing as its authority. Concretely, and considering charitable foundations only, it proposes that pro-

fessors in our colleges and technical schools shall be represented among the trustees of those institutions, librarians and heads of departments among those of libraries, scientific men among those of institutions of research, physicians among those of hospitals, clergymen among those of religious establishments, directors and curators among those of museums, social workers among those of foundations for popular betterment. In the most general terms it claims that any corporation should include members embodying in their own persons the special types of skill essential in carrying on its work. This claim is based on the conditions of permanent efficiency in collective enterprises. Its recognition is growing among us and will one day be general. That day will be the day of the expert.

Such a change in the make-up of corporations in this country may be said to round out an organization which practical sagacity has already partially developed in foundations of private origin and public aim among us. The men of general repute which it has been our custom to choose for positions of charitable trust have acquired by the logic of events their special necessary function in the fulfilment of these trusts. This function is that of winning support for the institutions they control. In our own country more than in any other, corporations not for profit are the fruit of private initiative. The first requisite for their establishment and maintenance is the selection of a board of trustees whose names, with those of their successors, will be an earnest of coming gifts because a guarantee of their safe and conscientious handling. Before we can do anything, we must have something to do with. But although ample and assured support is a condition necessary to the success of an institution, it is not a condition sufficient to success. A function equally necessary, and with support sufficient, is that of the accomplishment of purpose. This is the second and no less exacting half of the task; with us overshadowed by the first, because the accumulation of our wealth has outrun our provision of knowledge and skill to utilize it. The positive system of control repairs this omission, now out of date. It supplements our present provision of means by providing also for ends. It would impose the total charge of an institution upon a body fitted to bear both halves of it. Neither the men of social and financial standing who now compose the boards of our charitable institutions, nor the specialists now active in their aid, but now commonly excluded from those boards, are equal to the whole duty. Only men of affairs are competent to the business management of their trust. Only men in comparison withdrawn from the public eye in the long exercise of special aptitudes are competent to its professional conduct. The men of means and the men of ends must join forces in order to the best achievement of their common purpose.

The practical application of the principle of control by mixed boards presents various questions.

Is the demand that all the different forms of professional skill utilized by a corporation shall be represented therein an ideal realizable in the instance of large institutions? Theoretically no; practically yes. All the expert ability employed will in a measure be represented by each professional member; and by rotation in office among them, the recurrent grasp by the board of the affairs of the foundation may be extended to minutiæ in any degree.

Again, is it wise to place experts in charge of experts? The point may be debated, but is irrelevant. The positive sys-

tem does not propose to do so, but to give them a share in controlling others. The question—Who shall decide when doctors disagree?—finds its answer when another equal authority is present to add considerations beyond the scope of either. Such deciding voices are provided for in the mixed boards contemplated in the positive system. Its ideal is that every form of consideration which enters into the work in hand shall have its representative in the body which controls.

Again, should the experts employed by a charitable corporation be eligible thereto, or ought its professional membership to be chosen outside? Choice from the staff suggests a double doubt. Suppose a superior officer and his subordinate chosen; would not their equality on the board weaken the administrative control of the superior? No; for the equality is that of ultimate authority. The superior exercises his control as the delegate of the inferior as well as of himself and others. The inferior who disputed it would question his own right. There is no surer means of interesting any one in subordination than to give him power.

The doubt has another bearing. It also reflects the importance of the individual interests at stake in the case of employees. Will not their concern for their pay, as a rule, dominate their concern for their work?

The democracy of similarity says yes. The craving for money is the dominating motive in all men at all times. The democracy of individuality says no—basing its reply on a distinction. As social affairs are now arranged, some money is a perpetual necessity to us all, hardly less inexorable than the air we breathe. Else why should men and women still starve among us? But more money is an increasing luxury, the desire for which may be outweighed by many other interests. The *auri sacra fames* is an illegitimate child of the hunger for bread. In the case of the paid expert in a charitable corporation, some money is at most times assured, and motives are at all times present capable of tempering the desire for more. There are thus two reasons why his interest in his pay will not certainly dominate his interest in his work. His salary, while always moderate, is within limits safe; and the long exercise of his special aptitudes is at once fruit and source of motives apart from those of gain. The patience with which the specialist follows his task is the result of the fascinating germinal power of the ideas upon it of which his brain is the theater, and which his hand transfers to real life. They may become an efficient anti-toxin for the *cacoethes habendi*. Those who have had much to do with experts can echo the statement of Renan—"The reason why my judgments of human nature are a surprise to men of the world is that they have not seen what I have seen." To admit a rule by which experts when paid shall be excluded from charitable boards is to commit the absurdity of at once recognizing the exceptional man and treating him as if he were like all other men. Other grounds of bias—the desires for honor and power—unpaid members share with him. The receipt of pay as well will not disqualify those worthy of it.

Again, how are the permissive and the positive systems, respectively, related to the rights of free thought and free speech? These universal rights, so-called, are in essence duties of men in power. They should see to it that they do not so uphold the social order as to bar its advance. While all authority, therefore, is obligated to reduce to a minimum its repression of ideas and their utterance, no organization of control will absolutely prevent all danger of too high an interpretation of this minimum.

But a system by which seekers after truth in corporate service themselves share in the management tends to keep it within bounds. The positive system of corporate control thus obviates a danger to freedom inherent in the permissive system. It comes to the aid of free thought and free speech, entails a liberation of the spiritual forces within a nation.

The inclusion in charitable boards of men experienced in the actual accomplishment of their purposes is not new in this country either as a fact or an ideal. Their representation, never wholly lacking, is growing, and its extension is advocated with authority.

Frequently, if not commonly, a single chief executive officer, the head of the staff, is included in the board of trustees. The old ideal of the all-round man lingers in this provision, here swollen to impossible proportions. The admitted difficulty of finding satisfactory executive heads for institutions of the humanities is the sign of an unreasonable demand upon human capacity. No single executive, however active and talented, can embody in himself various types of modern professional knowledge and skill. The due representation of men of ends in any considerable corporation will always be a number greater than unity. A fair fraction of the board must be selected from their ranks. The demand upon the executive is thereby decreased to the manageable proportions of a business leadership, either with or without a special professional function.

Specialists have found a place already in a number of our scientific and artistic corporations. The charter of a noted scientific school, affiliated with a university, stipulates that of the corporation of nine, one third shall always be professors or ex-professors of the school. In another institute a larger proportion are persons in immediate control of the scientific work. No commanding need of appeal to the community for financial support existing in these cases, the men of ends have taken their natural place in the management along with men of means. Among museums of art more than one has chosen trustees from its own working staff and those of neighboring institutions.

In our chief universities, it has become the practise to allow the alumni a large representation in the board of trustees. Of the two bodies of persons concerned in the actual achievement of the teaching purpose—the teachers and the taught—this practise accords to one—the taught—its share in ultimate management. The step suggests, and may be believed to announce, a second, by which the other body—the teachers—will gain a similar representation. The class of alumni trustees has for its logical complement a class of faculty trustees; a class more indispensable to vital university success than their predecessors, in that they represent not the subjects but the source of university discipline.

The step has found prominent advocates. In the *Atlantic Monthly* for September, 1905, President Pritchett asks "Shall the university become a business corporation?" He suggests that the business of graduating men has little to do with the art of educating them, and concludes

> In the settlement of the larger questions of administration . . . may not some council composed of trustees and faculty jointly share the responsibility to advantage? . . . To-day we need, in my judgment, to concern ourselves in the university with the spiritual side of administration.

In articles entitled "University Control" published in SCIENCE in 1906 and 1912, Professor Cattell proposes that professors should take their place with alumni and interested members of the community in the corporation of a university, and re-

ports favoring opinions from a large majority of those holding the most important scientific chairs in the country. In his report for 1911–12 as president of Cornell University, Dr. Schurman writes:

> The only ultimately satisfactory solution of the problem of the government of our universities is the concession to the professorate of representation on the board of trustees or regents.

Such agreement in a recommendation is a prophecy of its acceptance.

When the day of the expert arrives, every corporation employing specialists will have its class of professional members, whether in a majority or a minority, whether chosen within or outside the staff, whether for limited periods or without term. Historical causes have both denied and begun to restore to expert ability in this country a place in the corporations to whose work it is necessary. The system of positive control by mixed boards is a final settlement of the question of the corporate sphere of the expert because the right settlement, granting to competence its share in the management of competence. The day of the expert brightens on the horizon. Let us welcome its advancing beams. Either we ourselves, or our early successors, will be called to labor in its full sunshine.

BENJAMIN IVES GILMAN

April 15, 1914

A TRIBUTE TO DR. HENRY P. WALCOTT

THE following letter was presented to Dr. Henry P. Walcott on the occasion of his retirement from the Massachusetts State Board of Health:

> TO HENRY P. WALCOTT, M.D., LL.D., CHAIRMAN, MASSACHUSETTS STATE BOARD OF HEALTH; FROM TWENTY-TWO HUNDRED MEMBERS OF THE MEDICAL PROFESSION OF THE STATE,—GREETING.
>
> *Sir:* On the 19th day of May, 1914, your term as a member of the State Board of Health ends, and we understand you are not a candidate for reappointment.
>
> Such an occasion can not be allowed to pass unnoticed, at least by those citizens who, as a class, should be most competent to gauge the value of such services to the state as yours have been.
>
> The best appraisal of those services is the mention of some of them, with a brief statement of your relations to the board.
>
> Your connection with the board began in 1880, 33 years ago, when, after ten years of independent existence, it had been merged with the conjoined Board of Lunacy and Charity, and you were unanimously elected its health officer. At this time, you served on a commission for the sanitary improvement of the Blackstone River, a precursor of your subsequent labors on similar problems.
>
> In 1886, by an act of the legislature, the Board of Health once more entered upon an independent existence. You were appointed a member for a seven years' term by Governor Robinson, a Republican, with the advice and consent of the senate, and became the chairman. You have since been reappointed three times for terms of seven years: once by Governor Russell, a Democrat, in 1893; once by Governor Crane, Republican, in 1900; and once by Governor Guild, Republican, in 1907. Since 1886, you have always continued as chairman of the board.
>
> Early in 1894, you began to consider the advisability of establishing a laboratory for the free production and distribution of diphtheria antitoxin; and such curative serum was actually distributed early in 1895, being the first so distributed in any state. This was made possible through the cooperation of Harvard University, secured by your influence, at the Bussey Institution, and was carried on for nine years—during this time as well as later under the personal direction of Dr. Theobald Smith—until 1903, when the legislature enacted a law authorizing the State Board of Health to produce and distribute antitoxin and vaccine virus. Again through your influence, a laboratory was built on the grounds of the Bussey Institution where the preparation of antitoxin and animal vaccine was carried on together.
>
> Within the last four years, you have served as chairman of two state commissions appointed to consider various important tuberculosis problems: one in 1910, and one in 1912. Reports were made to the legislature and printed as public documents.
>
> It is impossible to separate your work in connection with the Board of Health from that in connection with the North and South Metropolitan Sewerage Systems, the Charles River Valley System, the Charles River estuary improvement, the

Metropolitan Water Supply, and numerous other similar problems of perhaps secondary importance, such as the improvement of the Neponset River Valley, of the Concord and Sudbury rivers, of the sanitary conditions as respects water supply, sewerage, and sewerage disposal of many cities and towns which have been devised by the committee on water supply and sewerage of the Board of Health, of which Mr. Hiram F. Mills is chairman, and carried out in connection with its recommendations under your chairmanship of the board.

Since the reestablishment of the State Board of Health in 1886, under your chairmanship, it has been the custom of the legislature to refer all important sanitary questions to that board for investigation and advice, instead of creating special commissions, as obtains in many states. This custom, under your wise administration, has doubtless saved much money to the state and, at the same time, secured sanitary improvements recognized in all civilized countries as the best of their class.

The investigations and recommendations of the board have commended themselves to the legislature and in general have been carried out ultimately as presented.

From 1886 to the present time, you have been constantly and steadfastly facing these great and grave problems. Since 1895 when the State Board of Health made its report to the legislature, presenting a plan for the water supply of the city of Boston and the surrounding cities and towns, have been added to your responsibilities those of a commissionership on the Metropolitan Water Board. You have borne the responsibilities both of recommendation and of execution. . . .

You have met the responsibilities then assumed with such wisdom, discretion and rare modesty, as to make the task of your successor who would uphold the standards bequeathed to him a difficult one indeed.

THE EIGHTH REPORT OF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING

The eighth annual report of the president of the Carnegie Foundation for the Advancement of Teaching shows a total endowment of $15,325,000, and an expenditure for the year ending September 30, 1913, of $658,431. Of this $519,440 were distributed in retiring allowances to professors, and $80,949 in pensions to their widows, a total of $600,390. Thirty-three allowances were granted during the year, making the total in force 403, the average annual payment to an individual being $1,703. The total distribution from the beginning has been $2,936,927. The educational work of the foundation was separately endowed in January, 1913, by a gift of $1,250,000 from Mr. Carnegie through the Carnegie Corporation of New York. This body, which is endowed with one hundred and twenty-five million dollars for "the advancement and diffusion of knowledge and understanding," has five ex-officio trustees, of whom one must always be the president of the Carnegie Foundation for the Advancement of Teaching.

In connection with the foundation's work as a center of information concerning pensions, the president discusses pension systems that are maintained by half a dozen colleges, the development of new systems at Brown University, the Rockefeller Institute, and the American Museum of Natural History, the new federated pension system of the English universities, and the proposed system for the clergy of the Episcopal Church. Among pensions for public school teachers the report discusses the misfortunes of the New York City system, and commends the plans of the new state system in Massachusetts.

Much of the report is devoted to the development of the educational work of the foundation into a separate division of educational enquiry. Its recent work includes a study of education in Vermont at the request of the Vermont Educational Commission, of legal education at the request of a committee of the American Bar Association, and of engineering education at the request of a joint committee representing the national engineering societies.

The study of education in Vermont, already distributed, represents the first survey that has been made of a state's educational activities as a whole. The study of legal education has been begun by a first-hand enquiry into the bar examinations of every state, a special study of legal teaching by Professor Josef Redlich, who came from Vienna for the purpose, and by a personal examination of each of the 160 law schools in the country. Plans for

the study of engineering education are now being completed. The earlier educational work of the foundation is continued in the report by commendation of the present tendency of college entrance requirements toward both elevation and flexibility. The need for further improvement is shown by the fact that only 55 per cent. of the students now in our colleges are high school graduates. The decrease in the number of medical schools in the country from 162 in 1910 to 115 in 1913, and the rapid improvement of the better schools are commented upon with appreciation. A general study of the problems of the state regulation of higher education is illustrated by a detailed account of the recent crisis in educational affairs in Iowa.

The report further presents a study of the financial status of college teachers as compared with the situation presented in a similar study published five years ago. The ordinary salary of a full professor in the institutions associated with the foundation is now $3,000. During the last five years the salaries of instructors have risen by about $80; those of junior professors show a gain of from $120 to $225; those of full professors show an increase from $125 to $350.

The report concludes with a frank criticism of contemporary college catalogues. It is accompanied by the annual report of the treasurer. Copies may be had by addressing the Foundation at 576 Fifth Avenue, New York City.

THE PRELIMINARY ANNOUNCEMENT OF THE SAN FRANCISCO MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE American Association for the Advancement of Science has decided to hold a general meeting of the association in San Francisco and vicinity on the occasion of the Panama-Pacific International Exposition, in 1915, and has appointed a Pacific Coast Committee of thirty-two members to make the necessary arrangements. This Committee has recommended, and the American Association has approved, that the sessions of the meeting shall begin on Monday, August 2, and terminate on Saturday, August 7. It has been decided that:

(1) The general sessions of the meeting shall be held in San Francisco.

(2) The general evening lectures shall be delivered in San Francisco.

(3) The sessions for the presentation of addresses and papers in the separate divisions of science shall be held chiefly at the University of California, Berkeley.

(4) Sessions for the presentation of addresses and papers in the separate divisions of science shall be held on one day at Stanford University.

Subcommittees of the Pacific Coast Committee will in due time supply information to the members of the American Association and to the members of such other scientific societies as desire it: on transportation, by railways and by steamers, including the Panama Canal route; on living accommodations in San Francisco and vicinity, and at other Pacific Coast points; on excursions; on the leading features of the Panama-Pacific International Exposition, and on other subjects of interest.

Holding in mind that the San Francisco events of 1915 are in commemoration of the union of the Atlantic and the Pacific, through the medium of the finished Panama Canal, and that the Pacific region is hereafter to be in closer relation with the states and nations lying east of the Cordilleras of North and South America, and with the nations of Europe, the Pacific Committee on Scientific Program has adopted the following resolution:

> In view of the fact that the occurrence of scientific meetings in San Francisco in 1915 is in a manner a part of the celebration commemorating the opening of the Pacific to the peoples bordering the Atlantic it seems fitting that the program of meetings held in connection with this celebration should relate, as far as possible, to problems of world interest which pertain especially to the Pacific area.

The committee desires to add, by way of comment, that this resolution is not intended to discourage the presentation of worthy

papers on any subject whatsoever, but is merely to lay emphasis upon the desirability of papers on subjects concerning the Pacific region.

There will be four general sessions for the delivery of addresses by eminent men on subjects of wide interest. There will be many simultaneous or alternating meetings for the presentation of addresses and papers in the principal division of scientific knowledge. It is proposed that certain half days or whole days of the week be left free from scientific programs in the respective divisions in order that members and others in attendance may visit the exposition and other points of special interest in the vicinity.

The Pacific Coast Committee hopes that the 1915 meeting of the American Association, at a point so far removed from the usual meeting places of the general and special scientific societies of America and from the homes of their members, may be remarkable for the number of members of these societies in attendance and for the wide interest and high standard of the addresses and papers presented.

Please address correspondence to Albert L. Barrows, University of California Library, Berkeley, California.

SCIENTIFIC NOTES AND NEWS

A COMMITTEE has been formed in France, under the patronage of M. Poincaré, president of the Republic, for the erection of a monument in honor of J. H. Fabre, the famous entomologist. The idea is, not only to erect a monument at Serignan, but to preserve and to convert into a museum the estate of Harmas, the dwelling of the great naturalist. Subscriptions are asked from naturalists all over the world, and may be sent to the president of the committee, M. Henri de la Paillonne, mayor of Serignan (Vaucluse), France.

THE medical faculty of Turin has decided to erect a memorial to the distinguished physiologist, Angelo Mosso, in the institute in which he taught for many years. The memorial will be unveiled on November 14, 1914, the fourth anniversary of Mosso's death. Contributions should be sent to Professor Alberto Aggazzotti, Corso Raffaello, Torino.

REAR ADMIRAL ROBERT E. PEARY, U. S. N., retired, has received the gold medal conferred upon him by the French Geographical Society on April 24.

DR. BEVERLY T. GALLOWAY, newly appointed director of the New York State College of Agriculture, Cornell University, has formally resigned his office of assistant secretary of the U. S. Department of Agriculture.

IN addition to the Elliott Cresson medals presented by the Franklin Institute, Philadelphia, to Dr. Smith and Mr. Wright, noted in the last issue of SCIENCE, medals were awarded and forwarded through the department of state to Professor Linde and Professor Eder. The grounds of the awards are stated by the committee as follows:

Karl Paul Gottfried Linde, Ph.D., in recognition of his scientific investigations of the processes of refrigeration and the liquefaction of gases and of his inventions of machinery for applying these processes in the manufacture of ice and for the purposes of cold storage.

Edgar Fahs Smith, Ph.D., Sc.D., LL.D., in recognition of his leading work in the field of electrochemistry, of his many contributions to the literature of chemical science, and of his great service in university education.

Joseph Maria Eder, Ph.D., in recognition of his important original researches in the science of photo-chemistry and of his many valuable contributions to the literature of that science and of the graphic arts.

Orville Wright, B.S., LL.D., in recognition of the epoch-making work accomplished by him, at first together with his brother Wilbur and latterly alone, in establishing on a practical basis the science and art of aviation.

LEWIS E. MOORE, professor of civil engineering at the Massachusetts Institute of Technology, has been appointed engineer of bridges and signals of the Massachusetts Public Service Commission, and resigned from the faculty of the institute.

DR. G. M. GUITERAS, of the Public Health Service, has been called to Tampico, Mexico, with the consent of the constitutionalist forces,

now in control of that place to "clean up" the city.

PREVOST HUBBARD, in charge division of roads and pavements, The Institute of Industrial Research, Washington, and Arthur H. Blanchard, professor of highway engineering at Columbia University, have been elected by the council of the International Association for Testing Materials the American members of a commission on "Standardization of Methods of Testing and Nomenclature of Road and Paving Materials."

SELSKAR M. GUNN, professor of biology in the department of sanitary biology and public health at the Massachusetts Institute of Technology, has been made managing editor of the *American Journal of Public Health* succeeding Dr. Livingston Farrand, formerly professor of anthropology at Columbia University, now president of the University of Colorado.

PROFESSOR DAVID EUGENE SMITH will represent Columbia University and the Bureau of Education at Washington at the Bacon Septenary celebration at Oxford on June 10, and at the Tercentenary Napier celebration at Edinburgh on July 22. He will spend the academic year 1914–1915 in travel abroad.

DR. J. P. IDDINGS, of the U. S. Geological Survey, will lecture at the University of London from June 4 to 9 on "Problems of Petrology." Mr. Iddings is on his way to the Netherlands, Indies and the islands of the South Pacific to study igneous rocks, traveling under the auspices of the Smithsonian Institution of Washington.

PRESIDENT R. C. MACLAURIN, of the Massachusetts Institute of Technology, is making a visit to the Pacific coast.

MESSRS. FREDERICK G. CLAPP and Myron L. Fuller, of the Associated Geological Engineers, Pittsburgh, are engaged in the examination of the northern parts of Chili and Shensi provinces in China for petroleum for the Standard Oil Company.

DR. ELWOOD S. MOORE, professor of geology and mineralogy at the Pennsylvania State College, has been granted a year's leave of absence for 1914–15, and plans to spend it traveling abroad. He will sail from San Francisco on June 23, for Australia, in order to attend the annual meeting of the British Association for the Advancement of Science. After six months spent in Hawaii, New Zealand, and the East Indies he will study the balance of the time, until the fall of 1915, at the University of Berlin with Professor Krusch, of the department of economic geology.

THE annual stated meeting of the American Medico-Psychological Association is being held in Baltimore this week. A symposium on "Paresis" was announced for May 26. On the following day the annual address was delivered by Dr. Lewellys F. Barker on "The Relation of Internal Medicine to Psychiatry," and on the fourth day there was a symposium on "Eugenics."

MR. W. F. HILLEBRAND, chief chemist of the U. S. Bureau of Standards, lectured recently before the Cornell section of the American Chemical Society on "Chemistry at the Bureau of Standards."

THE Page-May memorial lectures of University College, London, for the current session will be delivered by Dr. Keith Lucas, whose subject will be "The Conduction of the Nervous Impulse." The course is given on Fridays, beginning on May 15.

PROFESSOR V. KARAPETOFF, of the department of electrical engineering, Cornell University, has completed an extended lecturing tour. His itinerary and topics were as follows: May 9, Springfield, Mass., an address before the Eastern Association of Physics Teachers on the subject of "Some Calculations in the Magnetic Circuit." May 11. Cleveland, Ohio, an address before the engineering students of the Case School of Applied Science on "The Production of a Revolving Magnetic Field." On the same day, a lecture before the Case School chapter of the Society of Sigma Xi on "The Dielectric Circuit." On Tuesday, May 12, an address before the engineering students of the Carnegie Institute of Technology,

Pittsburgh, on "Some Transient Electrical Phenomena," and on the evening of the same day, a paper before the Pittsburgh section of the American Institute of Electrical Engineers, a paper on "The Preparation and Qualifications of a Teacher in Engineering." On May 13, he addressed the students of the University of Pittsburgh on the "Electrification of Steam Railroads."

At the University of Glasgow on commemoration day, June 23, an oration on Lord Lister will be delivered by Sir Hector C. Cameron.

Professor Rudolf Tombo, Jr., of the department of Germanic languages, Columbia University, known also to readers of this journal for his articles on "University Registration Statistics," died on May 22.

We regret also to record the death of Mr. Herman Frasch, the industrial chemist, at one time chief chemist of the Standard Oil Company.

UNIVERSITY AND EDUCATIONAL NEWS

Lafayette College is a beneficiary in the will of Mr. William Runkle to the amount of $100,000.

The South Wales and Monmouthshire University College at Cardiff has received from an anonymous donor funds for the erection of a school of preventive medicine. The money value of this gift, together with that of Sir William James Thomas to erect a school for other branches of medicine in connection with the college, is estimated at £180,000.

The cornerstone of the Julius Rosenwald Hall at the University of Chicago will be laid on the morning of Convocation Day, June 9. The address will be given by Professor T. C. Chamberlin, head of the department of geology, who has been connected with the university since its founding.

The new building of the department of forestry of the New York State College of Agriculture was formally opened on May 15. Among those who made addresses were Professor James W. Toumey, director of the Yale Forest School; Dr. Henry S. Drinker, president of Lehigh University, Mr. Gifford Pinchot and Dr. L. H. Bailey.

The fiftieth anniversary of the founding of the School of Mines at Columbia University is being celebrated this week. On Thursday night there is a reception in the gymnasium. On Friday morning there well be a convocation at which honorary degrees will be conferred upon a number of eminent graduates of the School of Mines, and there will be addresses by Professor H. S. Munroe, Mr. T. W. Rickard and Mr. Hennen Jennings. In the afternoon the first lecture on the Chandler Foundation will be given by Dr. Leo H. Baekeland. The celebration will close with a dinner at the Waldorf-Astoria in the evening, at which Professor J. F. Kemp will preside.

The foundation stone of the new School of Tropical Medicine at Calcutta, for the site and laboratory of which the government of India has appropriated $195,000, was laid recently by the governor of Bengal. The *Journal* of the American Medical Association states that the institute will accept students from all over the world, and it is hoped that students of medical research institutions of the United States may be sent to the school for study. Communications regarding the school should be addressed to Lieut.-Col. Leonard Rogers, I. M. S., Medical School, Calcutta.

A new department, that of hygiene and bacteriology, has been created at the University of Chicago by the board of trustees. The chairman of the department is Edwin Oakes Jordan, professor of bacteriology, and associated with him in the work of the department are Assistant Professor Norman MacLeod Harris and Dr. Paul Gustav Heinemann. During the present quarter also Associate Professor William Buchanan Wherry, of the University of Cincinnati college of medicine, is giving courses in advanced bacteriology and parasitology. The work in bacteriology was formerly included in the department of pathology and bacteriology, which now becomes the department of pathology, with Professor Ludvig Hektoen as head.

VARIOUS sub-departments of geology at Cornell University have been consolidated under one head and the committee of professors which has hitherto administered the affairs of the department has been dissolved. Professor Heinrich Ries has been appointed head of the department.

MONEY is being collected to endow a professorship of railroading in the Graduate School of Business and Administration of Harvard University, to be named in honor of Mr. James J. Hill.

DEGREES will be conferred at commencement upon 101 University of Illinois matriculants of the years 1868–92, who completed 36 term credits and did not receive degrees. The belated degrees will be conferred as of the classes to which they belonged. These were not granted at the usual time because the students did not follow courses exactly prescribed.

CHARLES SCHUCHERT, professor of paleontology, has been elected acting dean of the graduate school of Yale University for next year in the absence abroad of Dean Oertel.

DR. FREDERICK A. SANDERS, professor of physics of Syracuse University, has been appointed head of the physics department of Vassar College.

DR. C. C. ADAMS, of the zoology department of the University of Illinois, has accepted the position of assistant professor of forest zoology in the New York State College of Forestry at Syracuse University.

HERBERT FISHER MOORE, assistant professor of theoretical and applied mechanics in the engineering experiment station of the University of Illinois, has been promoted to be professor of engineering materials.

MR. E. R. BURDON has been appointed university lecturer in forestry at the University of Cambridge.

DISCUSSION AND CORRESPONDENCE

MODESTY OVERWORKED

TO THE EDITOR OF SCIENCE: I am very loath to be drawn into the controversy on nomenclature, but in a recent number of SCIENCE (April 24) Professor Verrill has seen fit to hold me up to obloquy for having wantonly violated two rules, one of which is of his own selection. I do not intend to discuss the advisability of this rule further than to enquire who is to be the arbiter of what is "obviously obscene"? Professor Verrill evidently regards *Urticina felina* as an appellation falling under this category, while others, equally modest, might reject *Metridium,* which he accepts with equanimity. Even granting that certain Linnean names in their original form might bring a blush to the cheek of some *casta Minerva,* are they therefore, in their modern associations, to be rejected on that ground alone? Surely such a principle, consistently applied, would deprive the world of many of its greatest possessions in science, literature and art! *Honi soit qui mal y pense!*

Nor do I intend to notice the personalities contained in Professor Verrill's letter, but, when he disputes the correctness of my conclusions as to the validity of the names *Metridium senile* and *Urticina felina* he is entering upon a criticism to which one may reply. His contention that *Priapus senilis* and *P. felinus* are unidentifiable from Linnæus's descriptions I have fully recognized, but I also showed that Linnæus himself, in the twelfth edition of the "Systema," furnished the basis for their correct identification, by giving as references for them the recognizable figures in Baster's "Opuscula subseciva," a work that Professor Verrill carefully refrains from mentioning. It is quite unnecessary to repeat here the facts and arguments in support of this view, as they are fully set forth in my paper, whose main object, so far as these two species were concerned, was to show that the confusion that has arisen in the synonymy of their Linnean names was quite unnecessary and that these names are valid according to the ordinary rules of priority. Professor Verrill thinks otherwise and prefers the specific terms *dianthus* and *crassicornis;* but why does he reject Pennant's *pentapetala,* which apparently antedates *dianthus?* Surely it, too, can

not be regarded as "obviously obscene" or rather let us say, immodest. My position, in brief, is that we have in Linnæus's reference to Baster's figure very clear evidence of what he intended the term *felinus* to imply, and, this being so, the application of his term *senilis* also becomes clear. I prefer Linnæus's identifications of his own species to any speculations as to other possibilities.

I am quite prepared to assume responsibility for having advocated the revival of the Linnean specific names for the two species in question, but Professor Verrill asserts that I also advocate the adoption of *Priapus equinus* for the form that he prefers to term *Actinia mesembryanthemum* (properly *mesembrianthemum*). I do not recall ever having advocated the use of the original Linnean name for this species, and, indeed, in the paper which has become the object for Professor Verrill's fulminations, it is only once mentioned and then as *Actinia* (*Priapus*) *equina*. I gave the name that form expressly to indicate that while recognizing the priority of *Priapus* according to the International Rules, I hoped that the long-established name of *Actinia* would not be dropped from our nomenclature. Apparently my mode of expressing this idea has been somewhat too subtle. It would, indeed, be unfortunate if *Actinia*, with all its associations, should be obliterated and it would also be unfortunate if the familiar *A. equina* should disappear. For Professor Verrill's statement that "the leading European authorities, familiar with the actinians of the same region, have never been able to agree as to his (*i. e.*, Linnæus's) species" is quite erroneous so far as this species is concerned, and equally untrue is the statement that "most writers, before McMurrich, have wisely rejected the names," mainly on the ground of their immodesty. I have taken the trouble to look up the references to the species now under consideration during the twenty-five years that preceded the publication of my paper and find that in *thirty-eight* it is quoted as *A. equina* and only in *four* as *A. mesembryanthemum*, although in several the latter name is given as a synonym for *equina*. Apparently there are quite a number of zoologists unburdened by such an exquisite sense of modesty as would compel them to reject this Linnean name, and the most convincing reason for the non-use of *senilis* and *felinus* has not been that stated by Professor Verrill, but, as a review of the literature will clearly show, the confusion in their application which early arose and to which I have referred in my paper.

J. Playfair McMurrich

THE FANNY EMDEN PRIZE OF THE PARIS ACADEMY

To the Editor of Science: It may be of interest to you to record the fact that the Academy of Sciences of the French Institute has published a statement in regard to the award of the Fanny Emden prize for the year 1913. This prize is of the value of 3,000 francs and is the result of a bequest made by Mlle. Juliette de Reinach of 50,000 francs, the interest of which is available every two years. The prize is to be awarded for the best work "in the field of hypnotism, suggestion or in general, of physiological action which may be exercised at a distance upon a living organism." The fund was made available in 1911. Thirteen candidates presented researches, but no prize was awarded. In 1913 the prize was divided, 2,000 francs to M. Emile Boirac and 1,000 francs to M. J. Ochorowicz.

The peculiar wording of the award lies in the fact that the Academy makes these awards as *encouragement* for meritorious work, but sets forth that neither of the essays submitted goes very far towards proving its thesis. Indeed, the report rather decidedly indicates that they contribute rather little towards the establishment of any conclusion. The report cites one or two experiments of M. Boirac which are certainly questionable, and require extraordinary confirmation before they can be regarded as evidential in the sense presented.

Nothing is indicated in the report to show that a research proving the absence of any such action "at a distance," or its extreme improbability, would not be considered; but the very wording of the original bequest seems

to suggest a leaning in favor of a positive conclusion. It is certainly to be regretted that a problem of this nature should receive even so partial endorsement as is implied by the French Academy of Science. Since the conditions of the prize do not require specific investigations, but make it available for an argument indicating the position of psychology on such an hypothesis, I trust that for 1915 some candidate will present a statement that will more adequately express the views of a considerable proportion of modern psychologists upon this subject. Psychology receives so slight a recognition in scientific competitions that it seems unfortunate that its interests should be prejudiced by a recognition of a subject somewhat tangential to its main problems, and yet one upon which it has been forced to express itself in view of the widespread public concern.

JOSEPH JASTROW

SCIENTIFIC BOOKS

Flies in Relation to Disease: Non-bloodsucking Flies. By G. S. GRAHAM-SMITH, M.D. Cambridge, University Press, 1913.

A first reading of Dr. Graham-Smith's admirable book is apt in a way to somewhat dampen the enthusiasm of the ardent fly crusader. This is especially apt to be the case with one who, like the present writer, has recently been told by Stiles, after his experiences in the Carolinas, that the half has not yet been told of the danger of the house-fly, and who only the other day heard Levy of Richmond, in an address before the State Health Association, emphatically state that even the most exaggerated newspaper statements of the dangers have underestimated them. Perhaps if Dr. Graham-Smith lived in the Carolinas or in Virginia he might share to a certain degree the views of Stiles and Levy, but, living in England, and being a most careful, conscientious, and thoroughly scientific laboratory worker, he has in this book held himself down to absolutely demonstrated statements and has viewed the problem almost strictly from the medical side. He has thus produced a work which will be highly pleasing to conservative people who have diagnosed current newspaper statements about the house-fly as yellow journalism.

A second and more careful reading of the book, however, will show that there is an abundance of demonstrated facts upon which to base mose vigorous anti-fly crusades. He states that it is certain that the house-fly is a potential disease carrier and a constant frequenter and disseminator of filth, "but," he says, "much remains to be done before Howard's name, 'the typhoid fly,' or Hewitt's generalization can be completely justified." Hewitt's generalization, by the way, is "It has been proved that the house-fly plays an important part in the dissemination of certain of our most prevalent infectious diseases when the necessary conditions are present." Both Hewitt and myself (quoting from Graham-Smith) "approaching the subject from the entomological standpoint, have based their conclusions in regard to disease mainly on evidence of an epidemiological character and have apparently accepted the bacteriological evidence almost without criticism. From the bacteriological point of view, however, while the evidence relating to the carriage of pathogenic bacilli by experimentally infected flies is fairly conclusive, that relating to the presence of these microorganisms in 'wild flies' is far from complete."

The book is a very thorough and a very cautious one, and covers a consideration of the species of non-bloodsucking flies found in houses, the life history of the house fly, its internal and external anatomy in much detail, its habits, the ways in which it carries and distributes bacteria, the bacteriology of city flies, the fate of organisms eaten by larvæ, and a lengthy consideration of typhoid fever, summer diarrhea, anthrax, other bacterial diseases, the carriage of the eggs of parasitic worms, myiasis, the diseases and parasites and other enemies of flies, and questions of control. It is an admirable compendium, containing many facts not hitherto presented, and bringing together the latest information in a way in which it can be easily and intelligently consulted.

On account of the conservatism of the author, great interest attaches to such statements as he makes concerning actual danger from flies. He shows that infected flies not only carry bacteria on their bodies and limbs, thereby contaminating substances over which they walk, but distribute bacteria which they have ingested, by means of vomit and fecal deposits. He shows that, while non-spore-bearing bacteria survive at the most only twenty-four hours on the limbs, flies nevertheless infect substances over which they walk with such organisms for several days by means of a fluid which they regurgitate from their crops. He also shows that the majority of the non-spore-bearing bacilli pass through the intestine and are in living condition in the fecal deposits. He states that flies feeding upon tubercular sputum suffer from diarrhea, a fact which may be of some importance in relation to their potentiality for spreading infection. He states that city flies carry in and on their bodies very large numbers of bacteria, many of which are fecal types and that these are more numerous in flies caught in congested or dirty areas. Pathogenic bacteria or allied types have been isolated from wild city flies. "Flies bred from larvæ living in material infected with anthrax spores are capable of communicating the disease for some days after they emerge."

He admits that the evidence is very strong that flies are the dominating factor in the dissemination of typhoid fever in military and other camps and in stations in the tropics, and that there is some evidence that they are factors in causing the autumnal increase in typhoid in England, but agrees with Chapin that it is unlikely that they play an important part in well-sewered towns. The evidence in epidemic diarrhea of children he thinks is not altogether conclusive, largely I imagine because, although the disease is admittedly infectious, the causative organism has not been identified with certainty. He considers that the annual mortality due to this disease is so great that "a serious attempt to conclusively ascertain the part played by flies in its dissemination, by exterminating them in some suitable areas, usually exhibiting a high mortality, though expensive, would be justified." It is interesting to note that this is just what was done last summer in New York City by Dr. Donald B. Armstrong, of the Bureau of Public Health and Hygiene of the New York Association for Improving the Condition of the Poor, with results that are convincing, and Levy of Richmond, in an address as yet unpublished, states that he has reduced the mortality from infantile diarrhea in Richmond more than fifty per cent. by anti-fly work and great care to protect the diapers of sick children from flies. Armstrong's experiment, by the way, was accompanied by a rigid control.

With regard to cholera, he states that the evidence concerning its spread by flies is somewhat old, but is so remarkable that careful investigation is highly desirable.

Admitting that flies are greatly attracted to tuberculous sputum and can carry and distribute *Bacillus tuberculosis* for several days, he contends that whether they are serious factors in the spread of the disease remains to be proved.

Concerning the organisms of other bacterial diseases, especially ophthalmia, he states that these may be distributed by flies, but little definite evidence on the subject is available.

It is surely not the intention of Dr. Graham-Smith to underestimate the danger from flies, although his book read by the unscientific eye may produce this effect on the unscientific mind. He closes with a strong plea for careful additional observations and investigations. For the elucidation of some of the problems, while expert knowledge is required, he states that accurate observations by workers without especial scientific training will be of the greatest assistance.

The book as a whole is an excellent one. I wish that the writer might have displayed more of the arguments against flies that are not founded upon definite bacteriological examinations; but there are other books that do that, and this one is a reliable one to have

on the desk to consult from time to time upon questions of exact fact. The interest in this line of investigation is so intense at present that it is perfectly obvious that enough new facts will be accumulated in another season to warrant the adding of several chapters.

L. O. HOWARD

The Progress of Scientific Chemistry in Our Own Times. By SIR WILLIAM A. TILDEN. New York, Longmans, Green and Co. 1913. Second edition. 15 × 20 cm. Pp. v + 366. Price, $2.25 net.

The period covered by the book is from 1837 to the present. The first date was selected because Queen Victoria then came to the throne, while the scientific justification might be that at that time the influence of Liebig's teaching was beginning to be felt. After the usual preliminary chapter on Lavoisier, Cavendish, Dalton and Berzelius, we get to the book proper. We start with the conservation of energy and Joule's determination of the thermodynamic equivalent of heat. This leads at once to Hess's law of thermochemistry, to the experiments of Julius Thomsen, to Berthelot's enunciation of his principle of maximum work, and to St. Claire Deville's work on dissociation. The second chapter—which perhaps should have been the first—deals with the distribution of the chemical elements and the recognition of them by the chemist. This, of course, involves Bunsen and Kirchhoff's work on spectrum analysis, the discovery of argon by Rayleigh and Ramsay, and the isolation of the other noble gases by Ramsay. The elements being given, the third chapter deals with the determination of the atomic weights, including the theoretical reforms of Cannizzaro and the experimental researches of Dumas, Stas and others. The work of Gerhardt, Laurent and others on types is also taken up in this chapter. This seems a mistake because the work has to be discussed later in its proper place. The justification for its inclusion at this point seems to be that it was necessary in order to determine the atomic ratios of carbon to hydrogen and oxygen. While this is doubtless true historically, it would have been more artistic to have passed over this difficulty gracefully and thus to have avoided repetition.

Once we have the atomic weights determined, we are confronted with Prout's hypothesis. The third edition will undoubtedly contain the account of the resurrection of this hypothesis by Rutherford, but only a prophet could have included that in this edition. After Prout's hypothesis has been disposed of, the remainder of the fourth chapter is devoted to Mendeléeff's periodic law and its developments. The question of constitutional formulas comes up in the fifth chapter, which carries us through the work of Kekulé. The fruitfulness of Kekulé's conception is brought to our minds clearly in the account of synthetical organic chemistry in the sixth chapter. In the seventh chapter we have Pasteur's work on optically active substances, and the theory of stereochemistry as developed by van't Hoff and Le Bel. The next step, historically and logically, is from the problem of the molecular structure to that of chemical affinity, and the eighth chapter is consequently devoted to a discussion of electricity and chemical affinity.

Up to this point, the treatment has been logical and coherent; but the ninth chapter is an intercalated one on the liquefaction of gases. There is no conceivable reason for introducing this chapter at this point except that the author perhaps did not know where else to put it. As a matter of fact it should have come in just before the account of Ramsay's isolation of the noble gases of the atmosphere. Presumably it was not put there because the author wished to discuss the liquefaction of helium, which he could not do until he had introduced helium to his audience. He should however have discussed the general problem of the liquefaction of gases as an introduction to Ramsay's work and he could then have taken up the liquefaction of helium as a special fact under the general properties of helium.

If this had been done, we should have passed directly from the chapter on chemical affinity to that on radioactivity. The loose ends are gathered up in a final chapter which includes

remarks on photochemistry, colloids and research work in Great Britain. Altogether this is a very readable book and all the more so because of the continuity of plan, which is quite unusual. Most writers of historical outlines content themselves—or are forced to content themselves—with isolated chapters. It is really quite a feat to have avoided this danger to so great an extent as Sir William Tilden has done.

The reviewer is entirely in sympathy with the contention, in the preface, that students should not only know the names of the leaders of scientific thought, but should perceive correctly the connection between their discoveries and the general progress of their science. In order to bring this about, a series of biographical notes has been appended to each chapter. In these notes are given a brief sketch of the life and work of every deceased chemist or physicist who has contributed substantially to the progress thus far accomplished.

Wilder D. Bancroft

BOTANICAL NOTES

PROTOCOCCUS, NOT PLEUROCOCCUS

In a recent number of *Nyt Magazin for Naturvidenskaberne* (Christiania) N. Wille gives the results of his studies of the actual specimens of certain lower green algae prepared by C. A. Agardh, and still preserved in the herbarium of the University of Lund, Sweden. One outcome of these is the settlement of the question as to whether or not the name *Protococcus* is still valid. As every teacher knows there has been a strong tide against the use of the name *Protococcus* for the common green slime of tree-trunks and walls, the preferred name being *Pleurococcus.* In the paper under consideration the author first gives a summary history of the nomenclatural tangle which has arisen. In 1824 C. A. Agardh named a certain plant *Protococcus viridis.* In 1842 J. Meneghini, not knowing Agardh's plants, proposed the name *Pleurococcus,* and included blue-green as well as green species, and among the latter he included the plants named *Protococcus viridis* by Agardh. Other forms of confusion resulted from this initial blunder of Meneghini's but what is here given is sufficient to warrant Wille's conclusion:

> It is clear that in order to disentangle such a confused mass of synonyms one must go back to the original specimens to determine what C. A. Agardh really understood by his species *Protococcus viridis.*

So he examined the original specimens and found that the specimens labeled *Protococcus viridis* are what later authors have called *Pleurococcus.* This fact requires, as Wille says, that "this species must therefore be called *Protococcus viridis.*"

Since *Pleurococcus* was used by Meneghini for blue-green and also green algæ that name is left badly discredited, and must doubtless fall into synonymy.

SHORT NOTES

Some recent systematic papers are: A Consideration of Structure in Relation to Genera of Polyporaceae, by Doctor Adeline Ames (*Ann. Mycol.,* Vol. XI.), including a key to, and descriptions of sixteen genera, with four half-tone plates; New Fucaceae, by N. I. Gardner (Calif. Univ. Pub., Vol. 4), containing descriptions of some western rockweeds and their close allies, and accompanied by eighteen half-tone plates of excellent photographs of the plants described.

Bulletins 284 and 285 of the Bureau of Plant Industry of the U. S. Department of Agriculture on the Water Requirement of Plant deal with some of the scientific facts that underlie the practical aspects of agriculture. In the first the joint authors, L. J. Briggs and H. L. Shantz, report in detail upon their investigations made at the dry-land experiment station at Akron, in northeastern Colorado, in the years 1910 and 1911. The bulletin is a valuable contribution to the physiology of the water loss sustained by plants under arid conditions. In the second bulletin the same authors have rendered a most welcome service to plant physiologists by presenting in summary form a review of the literature of the water requirement and water loss

of plants. These summaries are so systematically arranged that they must prove of the greatest help to plant physiologists.

ALLIED to the foregoing is Dr. F. J. Alway's paper, "Studies on the Relation of the Non-available Water of the Soil to the Hygroscopic Coefficient" (Research Bull. No. 3, Agr'l. Expt. Station of Nebraska).

AMONG the recent pathological papers are: M. T. Cook's Report of the Pathologist for the year 1912 (N. J. Expt. Station) enumerating especially the diseases of the year; Ethel Field's Fungous Diseases Liable to be Disseminated in Shipments of Sugar Cane (Circular 126; Bureau of Plant Industry, U. S. Dept. Agric.); Adeline Ames's New Wood-Destroying Fungus (*Bot. Gaz.*, May, 1913); P. J. O'Gara's Studies on the Water Core of Apples (*Phytopathology*, April, 1913), and Organization and Methods of Control of Plant Diseases (Wash. State Hort. Assn., 1913).

HERE may be mentioned H. R. Cox's paper, "Controlling Canada Thistles" (Farmer's Bulletin 545, U. S. Dept. Agr.), containing a good deal as to the biology of these weeds, as well as practical suggestions as to how they may be eradicated.

HERE too should be noted O. F. Cook's "Wild Wheat in Palestine" (Bull. 274, Bureau of Plant Industry, U. S. Dept. Agric.), describing "a new type of wheat growing in a wild state" in Palestine. Though this paper "does not attempt to reach a final decision on the question whether the wild wheat of Palestine is the true ancestor or prototype of the domesticated varieties of wheat," it does serve to bring out "several additional facts regarding the character and habits of the plants."

THE NEW VOLUME OF THE SYLLOGE FUNGORUM

QUITE recently the twenty-second volume of this work reached American subscribers. It is a continuation of the "Supplementum Universale" of the twenty-first volume, and includes the descriptions of added species of fungi to the end of the year 1910. Like the volume immediately preceding, it is the joint work of P. A. Saccardo and Alex. Trotter. It is devoted to the Ascomyceteae (pp. 1–822) and Deuteromyceteae (pp. 823–1505). A Repertorium of 24 pages, an Alphabetical Index of species (69 pages), and an Index of Genera (13 pages) close the volume.

CHARLES E. BESSEY
THE UNIVERSITY OF NEBRASKA

SPECIAL ARTICLES

THE SOLAR SPECTRUM AND THE EARTH'S CRUST

PROFESSOR ROWLAND'S list of the elements whose lines appear in the solar spectrum has long been a classic work of reference among astronomers, and Dr. F. W. Clarke's summary of the chemical composition of the earth's crust occupies a similar position among geologists. Each list has been thoroughly discussed, by various writers, from the standpoint of the science to which it belongs; but little attention seems to have been called to the striking resemblances between the two.

In the annexed table are given (1) Rowland's list of the elements whose dark lines appear in the integrated spectrum of the sun, arranged in the order of the combined intensity of the lines of each element, as quoted in Abbot's "The Sun," p. 91 (1911); (2) a similar list of the elements, arranged in the order of the intensity of their bright lines in the spectrum of the solar atmosphere, as photographed at the total eclipse of 1905 by S. A. Mitchell[1]; (3) Clarke's table of the percentage composition of the outer ten miles of the earth's substance, including the lithosphere, hydrosphere and atmosphere,[2] and (4) the average composition of ninety-nine stony meteorites, as derived by G. P. Merrill from published analyses.[3]

[1] *Astrophysical Journal*, 38, 407–495, and 39, 166–177, 1913–14.

[2] As given by him in Bulletin 491 of the U. S. Geological Survey, pp. 27–33, with additional data from papers in the *Proceedings of the American Philosophical Society*, Vol. 51, p. 220, 1912, and the *Journal of the Washington Academy of Sciences*, Vol. 4, pp. 59–62, 1914.

[3] Quoted by Clarke on p. 39 of the work first cited.

	Solar Spectrum, Dark Lines (Howland)	Chromosphere, Bright Lines (Mitchell)	Earth's Crust, Outer 10 Miles (Clarke)		Stony Meteorites (Merrill)	
1	Ca	Fe	O	49.85%	O	35.75%
2	Fe	Ti	Si	26.03	Fe	24.52
3	H	H	AL	7.28	Si	18.20
4	Na	Cr	Fe	4.12	Mg	13.80
5	Ni	Ca	Ca	3.18	S	1.85
6	Mg	V	Na	2.33	Al	1.45
7	Co	Sc	K	2.33	Ca	1.25
8	Si	Zr	Mg	2.11	Ni+Co	1.32
9	Al	C	H	0.97	Na	0.70
10	Ti	Mn	Ti	0.41	Cr	0.34
11	Cr	Mg	Cl	0.20	K	0.27
12	Sr	Ni	C	0.19	P	0.11
13	Mn	Ce	P	0.10		
14	V	Nd	S	0.10		
15	Ba	He	F	0.10		
16	C	Co	Ba	0.09		
17	Sc	Y	Mn	0.08		
18	Y	Sr	Sr	0.03		
19	Zr	Ba	Cr	0.025		
20	Mo	La	Ni+Co	0.018		
21	La	Sa	V	0.015		
22	Nb	Al	Zr	0.013		
23	Pd	Er	Cu	0.010		
24	Nd	Gd	Zn	0.004		
25	Cu	Na	Li	0.004		
26	Zn	Si	Pb	0.002		
27	Cd	Eu	Br	0.0006		
28	Ce	Zn	As	0.0004		
29	Gl	Dy	Cd	0.00002		
30	Ge	Cu				
31	Rh	Pr	Allowance for all other elements 0.38			
32	Ag	Nh				
33	Sn					
34	Pb					
35	Er					
36	K					

All these lists are doubtless incomplete at the lower end. Later researches have shown that oxygen, gallium, ruthenium and all the rare earths given in Mitchell's list, should be added to Rowland's table, raising the number of elements represented to forty-five. The presence of nitrogen is also indicated by the appearance of the cyanogen bands, but not by its own lines. Photographs showing fainter lines would probably considerably extend the list of elements recognizable in the flash-spectrum. The list of elements in the earth's crust is certainly very incomplete below those which form 0.01 per cent. of the total. If carried out to the limit it should of course include all the elements, and it is not yet known what positions some of them, such as the rare earths, would occupy in a complete scheme. The list for the stony meteorites is probably far from exhaustive, and it is not safe to draw conclusions from the failure of some elements to appear in it. It may be added that, according to Farringdon,[4] the average percentage of nickel in meteoric irons is about 7.5, and that of cobalt about one tenth as much, while that of copper averages about 0.02. It would therefore seem reasonable to suppose that the amounts of "Ni+Co" given in the table should be divided between the two metals in about this ratio.

Upon comparing the lists of Rowland and Clarke, we meet at once the fact—one of the commonplaces of astrophysics—that the non-metallic elements, with the exception of carbon and silicon, are scarcely if at all represented in the solar spectrum. The only one whose lines appear is oxygen—which is from 20 to 100 times more abundant in accessible materials than all the others put together (excepting C and Si, as above). If we simply accept this fact (which is still without adequate explanation), and exclude these non-metallic elements from the comparison, the similarity between the order of the remaining elements in the two lists is remarkable.

Of the eight metallic elements (including carbon and silicon under this head for the moment) which are most abundant in the earth's crust, six are among the eight whose lines are strongest in the solar spectrum, and one of the other two comes ninth in the solar list. Of the next eight metallic elements in the terrestrial list, seven are found among the second group of eight in the solar list, and the other one (Ni) is among the first eight. That is, fifteen of the sixteen leading metallic elements are common to the two lists, and there is a general similarity in their relative order in the two.

Beyond this point comparison becomes hardly practicable, as the terrestrial list is probably incomplete. Four of the next eight elements in Rowland's list are rare earths, for which there are as yet no sufficient analytical

[4] Publications of the Field Columbian Museum, Geological Series, Vol. 3, No. 5, p. 110.

data. It is clear, however, that the elements whose lines are faint in the sun are, in general, present in but very small proportions in the earth's crust.

It is very remarkable that the correspondence of the two lists is so close, in view of the radical differences in the methods of investigation, and the great differences in the relative intensities of the lines in stellar spectra of different types. Even in the bright-line spectrum of the solar atmosphere, the similarity is by no means as pronounced.

Out of the first sixteen elements in either list, only one, barium, has an atomic weight exceeding 100, and but one other, strontium, one greater than 60. The significance of this fact has frequently been discussed by geologists or by astronomers.[5] In both cases it has been suggested that the heavier elements lie for the most part deep within the body, and out of reach; but Clarke gives good reasons for believing that, even in the earth's interior, the lighter elements are more abundant than the heavier. This suggests that the faintness or absence of the lines of the heavier metals in the solar spectrum may be due largely to the small proportions in which they occur, and some confirmation of this is found in the fact that, of the elements of atomic weight greater than 180, only lead, which is the most abundant in the earth's crust, appears at all in the sun. But the rarity of these elements can not be the whole explanation of their absence from the solar spectrum, for although no lines of Os, Ir or Pt occur in it, the stronger lines of the equally rare elements Ru, Rh and Pd (whose atomic weights are about half as great) appear distinctly, though faintly.

The element which is most disproportionately conspicuous in the sun, in comparison with its terrestrial abundance, is cobalt. Nickel too is relatively high on the solar list. This may be partly explained by the great number of lines in the spectra of these elements, which gives them undue weight in a spectroscopic count. It is also worthy of notice that, if 25 per cent. of meteoric iron were added to a sample of the earth's crust, and the composition of the resulting mixture considered, iron would occupy the first place among the metallic elements, nickel the eighth, and cobalt the eleventh, and the discordance with the solar list would disappear. Of the elements abundant in the earth, and relatively less conspicuous in the sun, silicon apparently approaches the typical non-metallic elements in its behavior, while aluminium has only four lines in the observable region, and is thus handicapped by the spectroscopic method of detection.

The principal differences in the order of the metallic elements in the two lists are therefore easily explicable, with one conspicuous exception. Potassium, which is one of the principal constituents of the earth's crust, and is fairly abundant in meteorites, shows as the merest trace, if at all, in the solar spectrum, although many strong lines, both of the principal and the subordinate series, lie in the observed region. Their absence, in spite of the presence of conspicuous lines of elements which are far less abundant in terrestrial materials, is remarkable, and would seem to demand some special explanation. It is of interest in this connection that potassium, alone among the more common elements, is slightly radio-active. If this indicates that its atoms are relatively unstable, they might break down under solar conditions; but this is a highly speculative consideration. The lines of the more strongly radio-active elements do not appear at all in the solar spectrum; but this may be accounted for by their extreme rarity (on earth, at least) and their high atomic weights. It should however be mentioned that lithium, which is next to potassium in abundance among the alkali metals, and occurs in sensible proportions in the earth's crust, but, so far as is known, is not radio-active, is also practically absent from the solar spectrum—though Adams[6] points out that a very faint line, greatly strengthened in sun-spots, at wave-length 6708.08 may represent the strongest line in the lithium spectrum.

[5] Compare Clarke, *op. cit.*, p. 33, and Abbot, "The Sun," pp. 92–94, 253–254.

[6] *Astrophysical Journal*, Vol. 30, p. 92, 1909.

In spite of these exceptions, the agreement of the solar and terrestrial lists is such as to confirm very strongly Rowland's opinion that, if the earth's crust should be raised to the temperature of the sun's atmosphere, it would give a very similar absorption spectrum. A moderate admixture of meteoric material would make the similarity even closer.

In conclusion, the writer desires to express his very hearty thanks to Dr. Clarke, for valuable information on the geochemical side of the problem, and for the suggestion that the comparison here made (which has been given in the writer's lectures for several years) may contain enough that is unfamiliar to justify its publication.

Henry Norris Russell
Princeton University Observatory,
May 5, 1914

The American Association for the Advancement of Science

Section K—Physiology and Experimental Medicine

At 4:30 o'clock on the afternoon of Friday, January 2, 1914, Section K met at the Atlanta Medical College, Atlanta, Georgia, with Vice-president Theodore Hough in the chair. The address of the retiring Vice-president, Dr. John J. R. Macleod, entitled, "The Physiological Instruction of Medical Students," was read by title owing to the lateness of the hour.

The Section then began the symposium on the subject of pellagra. The first speaker, Dr. J. W. Babcock, superintendent of the State Hospital for the Insane, at Columbia, S. C., spoke on the "Medico-Legal Relations of Pellagra." Dr. Babcock has not sent to the secretary an abstract of his remarks.

Captain J. F. Siler, of the U. S. Army Medical Corps, Dr. P. E. Garrison, U. S. N., and Dr. W. J. MacNeal, assistant director of laboratories, New York Post-Graduate Medical School, presented a paper read by Dr. MacNeal entitled, "Further Studies of the Thompson-McFadden Commission on the Etiology of Pellagra." An abstract follows.

"The Entomological Aspects of the Pellagra Investigation of the Thompson-McFadden Commission" was presented by Mr. A. H. Jennings, of the Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C.

Report of the Thompson-McFadden Pellagra Commission:

Information concerning the age and sex, occupations, location of domicile, general dietary habits and concerning the existence of pellagra was obtained upon about five thousand persons by a house-to-house canvass of six cotton-mill villages. A similar study was carried out in one rural district of four square miles in which several cases of pellagra had occurred. Many other communities were studied in less detail. There was no definite relation observed between the occurrence of pellagra and the use of any particular foods. New cases developed for the most part in the immediate vicinity of old cases or after close association with them. In districts completely equipped with water carriage systems of sewage disposal, we found pellagrins who had acquired the disease before moving to these districts. Cases apparently originating in these sewered districts were extremely rare and their origin there somewhat doubtful.

These observations strongly suggest that unsanitary methods of sewage disposal have an important relationship to the spread of pellagra. If these indications can be confirmed in other places, we feel that the proper correction of these conditions by the installation of water carriage systems of sewage disposal will go far toward restricting the spread of the disease.

The exact mode of transmission of pellagra is still uncertain and we strongly urge the continued study of food contamination, of insects as transmitting agents and of close personal association as possible factors in its spread.

Summary of Two Years' Study of Insects in Relation to Pellagra: Allan H. Jennings.

The results of a study by the writer and W. V. King, in cooperation with the Thompson-McFadden Pellagra Commission in Spartanburg county, S. C., are here summarized, the observations and conclusions referring to conditions in that region except where otherwise stated.

Infectiousness of the disease and its transmissibility by blood-sucking insects were assumed, purely as a necessary basis for our work.

A high percentage of female cases, especially among home-frequenting individuals and among children of both sexes is a marked characteristic of the disease, a transmitter which is active by day being thereby indicated.

The characteristics of the insects studied justify

the incrimination of the biting stable fly, *Stomoxys calcitrans,* alone. These characteristics and the species studied are given below.

The distribution of pellagra and its occurrence in persons seemingly not exposed to attack by lice, possibly, also, the sex incidence, are not satisfactorily explained by their incrimination.

Bed bugs, though abundant, fail to account for the sex incidence of pellagra, while the habits and scarcity of horse-flies exclude them.

The prevalent mosquitoes, *Culex quinquefaciatus* (=*fatigans*) are nocturnal in habit and the day-biting *Aedes calopus* is of irregular occurrence in the region.

The human flea, *Pulex irritans,* is rare or wanting in the county. Fleas of animals cause little annoyance and they do not explain the sex incidence.

Simulium species do not associate with man and pellagra sufferers are usually rarely exposed to their attack. They are negligible as a pest of man in the region. Pellagra occurs, also, in regions from which they are absent.

Sand flies (Chironomidæ), if present, are not a pest in the region.

The stable fly is a practically cosmopolitan and abundant species; it associates with man, invades his dwellings and attacks him freely; it bites by day and its longevity is considerable. Human blood has been determined in the stomachs of an important percentage of individuals and human blood may be drawn without pain, in many instances.

If the cause of pellagra is an intestinal bacterium, the house fly may very probably be a vehicle for its diffusion.

The house-infesting roaches, in this event, may also play a minor part.

Discussion of Pellagra—Mental Disturbances: E. BATES BLOCK, M.D.

There is no one type of mental disturbance characteristic of pellagra. Insanity is usually a late manifestation of the disease and when it occurs it usually means that the end is near. As a terminal event it usually assumes the type of the infective exhaustive psychoses, with clouding of the consciousness, confusion, hallucinations and changing delusions, with marked restlessness and apprehensiveness.

When the insanity occurs earlier in the disease before the exhaustion becomes marked, it is usually characterized by great depression with delusions which are depressive or persecutory in character. This is associated with marked apathy or restlessness and general nervousness and insomnia, and sometimes with excruciating headaches. Mental confusion is quite common; apprehensiveness is often a marked feature of the disease. Suicidal attempts are quite common, but in only one of the cases which I have seen has there been any violence towards others.

Sometimes the insanity precedes the physical signs of pellagra as a part of the disease. While insanity does not confer immunity to pellagra and the sequence may have been accidental, I have seen several cases which have developed insanity suddenly and were so shortly followed by symptoms of acute pellagra that I believed them to be a part of the same disease. One of these was apparently typically psychasthenia, another melancholia, while a third was apparently manic depressive insanity, but all were quickly followed by the typical signs of pellagra. The prognosis in these cases is much more favorable than in the cases in which the insanity developed as a late manifestation of the disease. Occasionally the apathy is so great as to suggest dementia præcox and the cases of this type that I have seen have run a very chronic and protracted course.

The development of insanity is not necessarily of fatal significance. In one of my cases the patient has remained perfectly well now for eight years and in another for five years, without any recurrence either of mental or physical symptoms.

The *prognosis of pellagra* was discussed by Dr. George M. Niles, of Atlanta, Ga., as follows:

My experience in the treatment of over six hundred cases of this malady has made me somewhat optimistic, and I feel that the attitude of extreme pessimism assumed by some observers is unjustified.

Pellagra, like some other diseases, seems more virulent when implanted on virgin soil. We note that in the Old World, where it has been rife for nearly two centuries, the mortality is not near so great. In this country it is in many respects a new enemy, and its prospective victims have not been able to establish, as it were, any form of immunity against its ravages.

In my professional intercourses with pellagrins and their inquiring friends I have adopted a classification as to the conditions in which a favorable outcome may be anticipated, or the reverse. There are four classes in whom I am extremely chary in holding out a favorable prognosis: First, pellagrins over fifty or fifty-five years of age. The pathologic changes of this disease closely simulate those of senility, and when to the changes

due to weight of years are added like burdens due to disease, Nature can not hope to successfully contend with both. Second, confirmed alcoholics. These unfortunates seldom recover from pellagra. Third, cases in which the mentality is seriously impaired. These psychic changes indicate marked destruction of important nerve centers, and render the prognosis doubtful. Fourth, that class of intellectual weaklings who have neither the intelligence nor pertinacity to faithfully hold to and observe a course of treatment for months or years, if necessary, but who are continually shifting from one to another, or taking the nostrums of quacks and charlatans. Practically all of this fourth class succumb.

On the other hand, those who are not included in the classes just mentioned, who will zealously and patiently carry out the medicinal, dietetic and hygienic rules of those physicians who are experienced in the care of such cases, the hope of ultimate and permanent recovery may be confidently grasped by the large majority.

Let me in closing admonish my hearers that the keynote in the treatment of pellagra is *optimism*. If the patient can be kept in good spirits, and in a consistently hopeful frame of mind, the higher centers, untrammelled by fears or obsessions, can best exert their beneficent influence over the lower centers, vegetative and otherwise, and with a brighter hope of victory can we combat this dreaded scourge.

L. O. Howard,
Secretary pro tem.

THE AMERICAN PHYSICAL SOCIETY

A regular meeting of the Physical Society was held at the Bureau of Standards, Washington, April 24 and 25, 1914. This was a joint meeting with the electrophysics committee of the American Institution of Electrical Engineers. The programs of the two morning and of the Saturday afternoon sessions were in charge of the Physical Society with President Merritt in the chair. The Friday evening session was in charge of the A. I. E. E. with Chairman J. B. Whitehead in the chair. The Friday afternoon session was given to a lecture by Sir Ernest Rutherford, F.R.S., of the University of Manchester, Eng., "On X-ray and Gamma-ray Spectra," complimentary to the American Physical Society.

Special features of the meeting were the opening of the new electrical building of the Bureau of Standards and an exhibit of physical apparatus. This exhibit was arranged under the direction of a committee of the American Physical Society with Dr. F. A. Wolff as chairman. It was a large and representative exhibit, participated in by thirty-two manufacturers, importers and industrial research laboratories, ten universities and educational institutions, and eight federal scientific bureaus.

Members of the Physical Society were especially invited by the National Academy of Sciences to attend the William Ellery Hale lectures by Sir Ernest Rutherford, F.R.S., upon "The Constitution of Matter and the Evolution of the Elements." These were given in the auditorium of the National Museum on April 21 and 23, and were attended by a large number of the Physical Society members.

All in attendance at the meetings were the guests of the scientific staff of the Bureau of Standards at luncheon on both days of the meeting. After the Friday evening session the local branch of the A. I. E. E. gave a smoker which was largely attended.

At a short business session of the Physical Society the following items of business were transacted:

On recommendation of the council, it was voted to establish a new grade of foreign members, to be defined as non-residents of North America, to pay dues of $4.00, with no initiation fee and to receive the *Physical Review* (with *Science Abstracts* on additional payment of $2.00) and having all rights of regular members in the society. Also, to make such changes in the by-laws as the establishment of this new grade of membership would necessitate.

On motion it was voted to approve and authorize an International Congress of Physics to be held in Washington in October, 1915, in case it should appear that it can be properly financed. (A committee of nine was appointed by the Council to determine this question).

It was voted that the president appoint a committee of three to express the deep sense of loss felt by the members of this society in the death of their former president, Professor B. O. Peirce.

The society voted to express to the director and members of the National Bureau of Standards its high appreciation of the generous hospitality extended to the society throughout the meeting, also to the Washington Section of the American Institute of Electrical Engineers for arranging trips and providing guides to various places of scientific interest in the city and its neighborhood.

The program of scientific papers was as follows:

"Solenoids," by C. R. Underhill.

"Some Investigations of Lightning Protection for Buildings," by DeBlois.

"A Milli-Ampere Current Transformer," by Edw. Bennett.

"Some Simple Examples of Transmission Line Surges," by W. S. Franklin. (By title.)

"Theory of the Corona," by Bergen Davis.

"High Temperature Measurements with the Stefan-Boltzmann Law," by C. E. Mendenhall and W. E. Forsythe.

"Cold-end Compensator for Thermocouples," by Charles B. Thwing. (Apparatus shown.)

"The Emissivity of Metals and Oxides. I.; Nickel Oxide (NiO) in the Range 600° to 1,300° C.," by G. K. Burgess and P. D. Foote.

"Formulæ for the Ordinary Mercury Contact Thermostat, and Some Practical Conclusions Deduced from Them," by W. P. White. (By title.)

"The Specific Heats of Mixtures of Water and Alcohol, and of Solutions of Non-Electrolytes in these Mixtures," by W. F. Magie.

"The Extension of the Spectrum in the Extreme Ultra-Violet," by Theodore Lyman.

"The Infra-red Arc Spectrum of Barium," by H. M. Randall.

"On the Growth and Decay of Color Sensation," by M. Luckiesh.

"Some Effects of Diffraction on Brightness Measurements made with the Holborn-Kurlbaum Optical Pyrometer," by A. G. Worthing and W. E. Forsythe.

"Further Experiments on the Use of the Photo-electric Cell in Stellar Photometry," by Jakob Kunz, J. Stebbins and W. F. Schulz.

"Displacement of Arc Lines not Due to Pressure," by Chas. E. St. John and H. D. Babcock.

"On the Accuracy of Terrestrial-magnetic Measurements," by L. A. Bauer.

"The Gamma-ray Comparison of Specimens of Radium Salts," by N. Ernest Dorsey.

"Note on the Photo-electric Effect with Potassium Surfaces in Very High Vacuum," by Saul Dushman.

"The Results of the Atmospheric Electric Observations on the Second Cruise of the *Carnegie*, June, 1910, to December, 1913," by C. W. Hewlett.

"Apparatus for the Spectroscopic Synthesis of Color," by H. E. Ives and E. J. Brady.

"New Methods for Measuring Time Constants of Low Resistances," by Frank Wenner, Ernest Weibel and F. B. Silsbee.

"A Sensitive Moving Coil Galvanometer," by F. Wenner, E. Weibel and F. C. Weaver.

"Some Records of the Wireless Time Signals Made with a Physiological Recorder," by C. W. Waggoner.

"Electric Conduction and Thermo-electric Action in Metals," by E. H. Hall.

"Electrochemical Indicators and Recorders. Instruments for Showing Continuously the Chemical Content of Solutions," by F. A. Harvey.

"Characteristic Curves of Tungsten Filament Incandescent Lamps and their Application in Heterochromatic Precision Photometry," by G. W. Middlekauff and J. F. Skogland.

"The Thomson E.M.F. in and the Thermal Conductivity of Tungsten at Incandescent Temperatures," by A. G. Worthing.

"A Direct Determination of h," by R. A. Millikan.

"Some Peculiarities in the Thermal Expansion of Invar," by Arthur W. Gray.

"A New Turbidimeter," by P. V. Wells.

"The Diurnal System of Convection," by Wm. H. Blair.

"The Control of the Wave-length Sensibility Curves for Selenium," by E. O. Dieterich.

"On the Relation between the Photo-electric Potential and the Frequency of Light for Potassium," by S. Karrer.

"Reflection and Scattering of Slow-moving Electrons," by Albert W. Hull.

"Reversible Transitions between Solids at High Pressures," by P. W. Bridgman.

"Surface Leakage over Insulators," by H. L. Curtis.

"Spark Potentials in a Magnetic Field," by R. F. Earhart. (By title.)

"Some Points with Regard to the Variation of the Specific Magnetization of a Substance with Temperature," by W. F. G. Swann.

"High Frequency Verification of Kirchoff's Capacity Formulæ," by F. C. Blake and Chas. Sheard. (By title.)

"Corona Produced by Continuous Potentials," by S. P. Farwell.

"A Significant Instance of Galvanometer Instability," by W. P. White.

"Wave-length Sensibility Curves of Potassium Photo-electric Cells," by H. E. Ives.

"An Electromagnetic Puzzle," by F. J. Rogers.

"The Photo-electric Effect of Carbon as Influenced by its Absorbed Gases," by Otto Stuhlmann, Jr., and R. J. Piersol.

"The Relation of Residual Gases to the Photo-electric Sensitiveness and the Contact E.M.F. of Sodium," by R. A. Millikan and W. H. Souder.

"Effect of Glass Walls on Thermionic Currents," by Saul Dushman.

"A New Design of Flicker Photometer for Laboratory Colored-light Photometry," by H. E. Ives and E. J. Brady.

"Note on the Physiological Effect of the Current," by F. J. Rogers.

"Examples of the Precision Attainable in Determinations of Thermal Expansivity," by Arthur W. Gray.

"Dioptric Formulæ for Combined Cylindrical Lenses at Oblique Axes," by Charles Sheard. (By title.)

"The Testing of Potentiometers," by Frank Wenner and Ernest Weibel.

"An Absorbing Solution for Eliminating Color Differences in Photometry," by H. E. Ives and E. F. Kingsbury.

"Photographs of Retrograde Rays, (*a*) from the Cold Cathode, (*b*) from the Hot Lime Cathode," by O. H. Smith.

A. D. Cole,
Secretary

THE SOCIETY OF AMERICAN BACTERIOLOGISTS

II

THURSDAY, JANUARY 1, 1914

Systematic Bacteriology

Morphology of the Bacteria (Vibro and Spirillum), An Early Research: Joseph Leidy, Jr.

This paper will be published in Science.

The Classification Card and the Type or Study which it Merits: H. A. Harding.

The classification card has not appealed to the pathologists, because they could test unknown cultures more quickly on animals, nor to water bacteriologists because their attention has been focused upon *B. coli* and special media, but it has been very valuable to students of bacterial ecology. The card is justly criticized because the observations of bacterial cultures are not always accurately recorded by it and because the present group number is unwieldy and of undetermined value as a basis for classification. One of the most urgent demands of bacteriology to-day is the careful testing out of various suggestions looking toward an improved technique. Dr. H. J. Conn has suggested that the ease of handling the group number can be increased by pointing it off into periods of about three figures each. The significance of such periods would be increased if each was devoted to a class of reactions such as morphology, fermentation, nitrogen relations and enzyms. The reactions should be selected for this group number after careful study of their accuracy and utility, and pending the results of this study the card of 1907 should be retained practically unchanged.

Constancy in the Fermentative Activity of Streptococci: Jean Broadhurst.

Attempts to correlate the fermentative results of different workers in saccharose mannit and other Gordon media have led to a series of experiments dealing with the different conditions characterizing the technique in different laboratories. Differences, such as acidity, presence or absence of sugars, subjection to raw and variously heated milks, were tried out without finding any definite results on the later Gordon reactions. Slight and brief increases in temperature (above 37°) depressed fermentative activity decidedly. Much more marked (as previously reported) were the contrasts resulting from the use of meat extract and of meat Gordon media. These effects are evidently not necessarily lasting. Permanent changes were effected by a stay in the alimentary canal (*e. g.*, a gain in lactose in dogs fed on streptococci-free milk). Cultures kept for 1 to 4 months on meat agar (10-day transfers) showed a gain in the amount of fermentative activity (the amount of acid), many strains show also a gain in the number of substances fermented; less often a loss occurred in the number of substances fermented. Studies carried on with individual animals for varying periods (2–10 mo.) showed unexpectedly wide ranges in the physiological types of mouth and fecal streptococci, affecting probably the diagnostic value of fermentative reactions. These, and other phases of the work reported upon, seem to warrant the following conclusions: (1) Constancy may be claimed for streptococci under identical or duplicate conditions. (2) Constancy in these fermentative responses is also characteristic of a large percentage of strains, under varying or varied conditions. Age, a stay in the alimentary canal, and meat extract, have more effect on such results than any of the (19) varied conditions tried.

The Relation of Habitat and Physiological Characters in the Streptococci: L. A. Rogers and Arnold Dahlberg.

It is reasonable to assume that true species in the bacteria will be found associated with a definite habitat as it is with the higher plants and animals. Studies were made of the physiological characters of 51 cultures from infected udders; 114 cultures from bovine feces; 31 cultures from

the mouths of cows and 42 cultures from milk obtained by selecting cultures showing chains in lactose bile at 37°. The morphology varied under different conditions but the udder cultures showed the most uniform and consistent chain formation. The cultures from the several sources differed in the amount of acid formed in dextrose broth, those from the mouth giving the highest acidity and those from the udder the lowest. The milk cultures were slightly higher than those from the udder. The udder cultures would be divided into two distinct groups, one of which fermented dextrose, saccharose and lactose and occasionally mannite and agreed with the published descriptions of strep. pyogenes. The second group frequently liquefied gelatin and in addition to dextrose, saccharose and lactose, usually fermented the alcohols mannite and glycerine. The cultures from feces were particularly uniform in their reactions, fermenting dextrose, saccharose, lactose and raffinose and frequently the polysaccharides starch and inulin, but failing to ferment the alcohols or liquefy gelatin. The cultures from the mouth differed from those from the udder in the higher percentages of raffinose, inulin and mannite fermenters and in less action on glycerine and gelatin. They are sharply differentiated from the feces organisms in their general failure to ferment starch and in the much higher percentage of mannite fermenters. Two of the milk cultures evidently belong with the feces group. All others may be placed in one of the two udder groups.

The Significant Characters of the Colon Group Isolated from Cow Feces: L. A. ROGERS, WM. M. CLARK AND ALICE C. EVANS.

Previous work on a collection of the colon type from milk demonstrated that the gas ratio and volume are constant under uniform conditions; that, on the basis of the gas ratio and volume, the cultures may be divided into two distinct groups and that the correlation of the fermentative ability with the gas ratio makes this distinction sharply defined.

This paper records the results of a similar study on 150 cultures isolated from bovine feces. None of these cultures liquefied gelatin and all but one found indol from tryptophane. By the use of a simple medium and exact methods of analysis it was found that in 149 cultures the CO_2:H_2 ratio varied from 0.98 to 1.20 only. One culture only gave a ratio identifying it with the high ratio group which made up 48 per cent. of the milk series. The 149 low ratio (0.98–1.20) cultures were readily divided into two groups, one of which fermented dextrose, saccharose, lactose, raffinose, mannite, glycerine and dulcite, but almost invariably failed to ferment starch, inulin and adonite, while the second group ferments dextrose, lactose, mannite and glycerine, occasionally ferments adonite and dulcite and fails to ferment saccharose, raffinose, starch and inulin.

These groups agree almost perfectly with two groups which may be formed from the low-ratio cultures isolated from milk. Special methods failed to give evidence, with the exception of the single culture mentioned, of the presence in bovine feces of the high ratio group which made up about one half of the milk collection.

Studies on the Classification of the Colon Group: I. J. KLIGLER.

Eighty organisms generally classed under the colon group were subjected to a series of fermentative and other tests with a view of determining their natural grouping as based on biometric principles. The following tests were employed: (1) Morphology, Gram. (2) Fermentation of dextrose, lactose, saccharose, raffinose, glycerine, mannite, dulcite, salicin and inulin. (3) Coagulation of milk. (4) Liquefaction of gelatin. (5) Production of indol. (6) Reduction of nitrates. (7) V. & P. reaction. Fifty-seven of the strains fell into the lactose fermenting division; twenty did not ferment lactose but fermented dextrose; three failed to ferment.

Acid production as determined by titrating aliquot portions of the broth with phenolphthalein as an indicator was found to be a more constant and a more reliable differential test than gas production, as ordinarily determined. The degree of initial acidity had no appreciable effect on the final acidity, which was quite constant, reaching its maximum on about the fourth day. The fifty-seven lactose fermenters attacked mannite, glycerine, saccharose, salicin raffinose, dulcite and inulin in the order named. Mannite, raffinose and inulin were found to be of minor or doubtful classificatory importance. Saccharose divides the lactose group into two distinct subgroups.

On subdividing the saccharose groups on the basis of dulcite and salicin fermentation respectively, it was found that the saccharose-salicin groups gave better correlations with indol production, V. & P. reaction and gelatin liquefaction, than did the saccharose-dulcite groups.

The saccharose positive, salicin positive group corresponds to ***B. aerogenes.***

The saccharose positive, salicin negative group corresponds to *B. communior.*

The saccharose negative salicin positive group corresponds to *B. communis.*

The saccharose negative salicin negative group corresponds to *B. acidi-lactici.*

Glycerine was found to be of value in separating the cloacæ forms from the aerogenes bacilli, 78 per cent. of the saccharose positive, salicin positive, glycerine negative strains being liquefiers.

It must be kept in mind, of course, that this classification was obtained with a relatively small number of organisms and can at best be considered only tentative. The results are, however, sufficiently interesting to merit further investigation, especially on the part of those interested in the bacteriology of water. Of the dextrose positive lactose negative forms five liquefied gelatine and fermented dextrose and saccharose but failed to ferment any of the other sugars, with the exception of glycerine, which was fermented by two of the organisms. Of the other tests, all were negative with the exception of indol, which was negative for the two glycerine positive organisms and positive for the glycerine negative. For the present all the five may be grouped under the name *B. vulgaris.* The sixty-two members of the colon group discussed may, therefore, be said to fall into six main species as follows:

Species	Specific Texts	No. of Organisms
B. communior	dex. +, lac. +, sac, +, sal. —,	12.
B. communis	..dex. +, lac. +, sac, —, sal. +,	11.
B. aerogenes	..dex. +, lac. +, sac, +, sal. +,	19.
B. acidi lactici	..dex. +, lac. +, sac, —, sal. —,	6.
B. cloacæ	....dex. +, lac. +, sac, +, sal. +, glyc. —,	9.
B. vulgaris	...dex. +, lac. —, sac, +, gel. +,	5.

A Biochemical Study of Proteins with Reference to the Behavior of Bacteria towards Pure Animal and Vegetable Proteins: Joel A. Sperry, 2d.

Solutions of unchanged egg albumin, serum albumin and edestin were carefully prepared. To these solutions sodium chloride, sodium sulphate, calcium chloride and potassium phosphate were added. The composition of these solutions was then of such a character that the bacteria were obliged to break down the protein molecule in order to obtain the necessary nitrogen to synthesize their food in the presence of the inorganic salts. The two most important factors in this investigation are: first, that the protein used is really a normal or unchanged protein, and second, that there must be nothing in the final solution from which the organism might obtain the necessary nitrogen, except the native protein. The organisms used in this investigation were *B. subtilis, B. prodigiosus, B. anthracis, B. proteus vulgaris* (two different strains), *B. proteus mirabilis, B. coli, B. typhi, B. pyocyaneus, Bacillus "Z,"* a proteus-like organism isolated from the feces of white rats fed on experimental protein diets, and the anaerobes, *B. putrificus, B. anthracis symptomatici,* and *B. edematis maligni.*

Test tubes containing about 10 c.c. of the protein solutions were inoculated from 24-hour slant agar cultures. In making the inoculations every precaution was observed to avoid transferring any of the medium to the tubes containing the protein solutions. Plates were poured immediately after inoculation, and at intervals of 24, 48, 96 hours, and one week; in a few instances ten days and two weeks. The amount of the inoculated material used in the plates was 0.5 c.c. of a 1:10,000 dilution. The plates were incubated at suitable temperatures and the number of colonies counted 24 to 48 hours later. The period of time during which the organisms survived after being planted in the protein solutions, as shown by the examination of the plates, varied from 48 hours to 10 days. None of the inoculated material gave any visible evidence of decomposition or even putrefaction. Flasks containing 25 c.c. of the different protein solutions were inoculated with various organisms and incubated at the optimum temperature for the organism under observation, for a period of two weeks. At the end of this time tests were made to determine the quantity of coagulable protein. The amount of coagulable protein in the inoculated flasks and the control flasks remained the same, showing clearly that there was no appreciable loss of protein.

A Study of the Bacteria Concerned in the Production of the Characteristic Flavor in Cheese of the Cheddar Type: Alice C. Evans and E. G. Hastings.

A comparative study of the flora of raw- and pasteurized-milk cheese of the Cheddar type has been made, with reference, particularly, to the production of characteristic flavors. The raw-milk cheese flora was found to consist of the following four groups of cheese organisms: *Bact. lactis acidi, Bact. casei,* Streptococci and Micrococci. Several varieties of each group occur in

the cheese, according to the classification as determined by the fermentation in broth containing carbohydrates or related substances. The flora of pasteurized-milk cheese is shown to depend upon the organisms introduced in the starter, with the exception of the *Bact. casei* group, which develops slowly and is concerned with the production of the biting flavor in mature cheese.

Many experimental pasteurized-milk cheeses were made with starters consisting of the organisms isolated from normal raw-milk cheese, either in pure culture or in varying combinations. The results of these experiments showed that pronounced differences in the flavor could be brought about by varying the cultures in the starter. Certain combinations in the starter resulted in an improvement of the flavor.

Technic

The Application of Practical Records to the Maintenance of Stock Bacterial Cultures: L. T. CLARK AND W. L. DODD. (By invitation.)

The scope of a bacterial culture bureau has been gradually broadened, as new organisms have been isolated requiring additional tests to differentiate between old and new species. To assist in their classification a practical system of records is a necessity and to this end the writers submit a method which has had three years' application. Essentially it consists of a double system of records: one, a card index, consisting of classification charts which provide for the morphological, cultural and biochemical characteristics as well as space for the name, age, source and number of the organisms in question. The auxiliary system is a book record of the cultures in numerical rotation.

To avoid confusion resulting from maintaining cultures on the shelves in numerical sequence, an arrangement in groups according to biochemical, morphological and cultural characteristics has been found convenient. Protection from light and dust is provided by means of the black boxes described by Novy. The variable requirements of organisms make it necessary to transplant them at intervals ranging from three weeks to a week or less. Growth of stock anaerobes is established in a volume of pure hydrogen gas. Most pathogenic types may be grown for the first twenty-four hours at incubator temperature, after which they are easily maintained at ordinary room temperature. Saprophytic cultures are kept continuously at room temperature. A duplicate set of cultures is maintained at a low temperature.

The following advantages may be claimed for the system as outlined: The history of the culture forms a part of the record and is readily available; the cultures are easily handled and transplanted; any one of the organisms may be easily and quickly located by its number, name or by some predominant biologic characteristic.

The arrangement in groups, of cultures of similar characteristics, facilitates a further and more complete classification. This leads to the detection of variations between strains of the same species.

A Study of the "Tellurite Reaction" with the Colon-typhoid Group and other Organisms: LEWIS DAVIS.

The writer has investigated the reaction of potassium tellurite with the more important members of the colon-typhoid group and allied organisms, with the view of determining:

(*a*) Differences in antiseptic action on the various members of the group; (*b*) variations in the macroscopical appearance, character and velocity of the "tellurite reaction" under optimum conditions; (*c*) the influence of treatment with tellurite on the biochemical activities of the organism.

The bacteria studied included the following, arranged in the order of their resistance to the antiseptic action of potassium tellurite: ***B. capsulatus mucosus, B. capsulatus, B. coli communis, Bact. (lactis) aerogenes, B. cloacæ, B. proteus vulgaris, B. paratyphosus "B," B. of swine plague, B. enteritidis, B. typhosus, B. paratyphosus "A," B. paracolon, B. acidi lactici, B. choleræ suis, B. rhinoscleromatis, B. pneumoniæ, Bact. dysenteriæ (Shiga), B. icteroides, Bact. dysenteriæ*** (Flexner) and ***B. zopfii.*** The variations in resistance to potassium tellurite, as well as in the appearance of their reaction with this salt, are considered sufficient to suggest the use of the tellurite for differential diagnosis within the colon-typhoid group.

The intensity of bacterial action on potassium tellurite was found to depend upon the individual resistance of the bacterium and the concentration of the salt present. The velocity of reduction of the tellurite is considered to be a specific function of an organism apart from its resistance to antiseptic action. Most of the types studied showed a reaction within thirty minutes. With the colon bacillus the reaction was almost instantaneous. Comparison was made of the action of "tellurited" and normal bacteria with dextrose, lactose and saccharose bouillons, respectively, as well

as with litmus milk. Treatment with potassium tellurite was found to have practically no influence on the biochemical reactions of an organism.

An Improved Technique for Performing the Grüber-Widal Test for Typhoid Fever: F. M. Meader, M.D.

The method herewith described is not new in its elements, but the combination is one which I have not noticed in other laboratories that I have visited or in the literature. We have been using the method in the city laboratory of Syracuse for three months now with considerable satisfaction. A description of the method is herewith offered.

Apparatus.—There are used the following materials: 1st, a vial with straight sides, 2 cm. long and having a 0.5 cm. lumen. The cork stopper has fixed into the inner surface a lance. (*A*) 2d, a standard wire loop made from a No. 25 U. S. gauge platinum wire, the lumen of which is 2 mm. in diameter. (*B*) 3d, a capillary pipette with perforated nipple, graduated in two places to deliver the equivalent of 3 and 4 standard loopfuls of serum. (*C*) 4th, a mixture tray having a dozen or more cells such as is used by artists for mixing paints. (*D*) 5th, a hanging drop slide. (*E*) 6th, cover slips. (*F*) 7th, alboline oil. 8th, sterile salt solution, 9th, a 24-hour bouillon culture of *B. typhosus.*

Procedure.—Prepare a control by placing a loopful of salt solution upon a coverslip. Then mix with it a loopful of the culture of *B. typhosus.* Place a ring of alboline oil around the depression in the cover glass. Invert the coverslip over the depression in the slide so that the center of the drop comes over the middle of the depression. Examine under the microscope to see that the culture is active and that the organisms are sufficiently numerous. If the preparation is satisfactory, the time is noted and it is set aside for one hour.

Given a sample of blood in vial *A*. If the vial is about one fourth full of blood, and is then centrifugalized, there will be a satisfactory amount of serum present. With the graduated pipette measure 4 loopfuls of salt solution into one of the cells of the mixing tray. Then measure 3 loopfuls of salt solution into another cell of the mixing tray. With the standard loop take one loopful of the serum and mix it with the salt solution first measured out. This makes the dilution of serum 1–5. Transfer a loopful of this mixture to the second solution measured out. This makes a dilution of 1–20. Transfer a loopful of this mixture to a coverslip. Add to it a loopful of the culture of *Bacillus typhosus.* This makes a dilution of 1–40. Prepare a hanging-drop slide as above with oil. Invert the coverslip over the depression and examine under microscope. Note the time and examine one hour later for agglutination.

The particular point of value in this technique is the use of the capillary pipette. Since there is a perforation in the nipple, the salt solution will rise to the graduations by capillary force, so that an exact amount of diluent can be easily and accurately obtained. The liquid can be pushed out into the cell of the diluting tray by covering the perforation with the finger and compressing the bulb. Since the viscosity of serum is greater than that of salt solution, the volume of a loopful of serum will be greater than the loopful of salt solution. So that in calibrating the pipette 3 and 4 loopfuls of serum should be used instead of salt solution in order that in practise the volumes of diluent and serum will be comparable. The method commends itself for its simplicity, rapidity of operation and precision in measurement.

A Synthetic Medium for the Determination of Colon Bacilli in Ice Cream: S. Henry Ayers and William T. Johnson, Jr.

In a study of the bacteria in ice cream we have endeavored to prepare a synthetic medium for the detection of colon bacilli. During the experiments 53 different combinations were tried. The most satisfactory medium was made as follows: Agar, 1.5 per cent.; asparagin, 0.3 per cent.; sodium dibasic phosphate, 0.1 per cent.; lactose, 1.0 per cent., and 2 per cent. of a saturated solution of litmus. The majority of the bacteria in ice cream did not grow on this medium, while colon bacilli showed quite characteristic acid colonies which with a little practise could be readily detected. The colon count on litmus lactose asparagin agar was compared with the estimated number from lactose bile tubes in 43 samples of ice cream. In 41 of the 43 samples the number determined on the plates was higher than the estimated number from the bile tubes.

Suspected colon colonies on the asparagin plates from 19 samples were picked off and inoculated into lactose broth fermentation tubes. From ten plates all the suspected colonies, or 100 per cent., proved to be gas formers. Among the other nine plates the percentages ranged from 87.17 per cent. to 98.01 per cent. This shows that it is possible to detect quite accurately any colonies of gas-forming bacteria on litmus lactose asparagin agar.

A comparison of this medium with Endo medium showed that the colon count on asparagin agar was much lower than that on the other medium. We found, however, that in some cases at least it was impossible to consider all typical colonies on Endo plates as colon bacilli. Certain strains of *B. coli* failed to give typical colonies on Endo plates and acid and peptonizing bacteria gave reactions similar to some of the colon strains.

It is evident that we have no entirely satisfactory method for the determination of colon bacilli, but it is believed that the use of synthetic media may be developed to a point where it will be superior to other methods.

A Satisfactory Platinum Needle: L. A. ROGERS.

The tendency of platinum needles set in glass handles to break when they are flamed, is a source of annoyance. A needle which will avoid this trouble may be made by fusing the platinum wire into a copper wire. This may be done by twisting a bit of small wire about the platinum wire and holding in the flame of a blast lamp until it forms a ball at the end of the wire. The copper ball and the end of a copper wire of the proper size are held together in the flame until they fuse. The rough joint obtained may be hammered or filed to approximately the diameter of the copper wire, which should be large enough to insure rigidity. The wire may be mounted in a capillary tube or in an ordinary glass tube with plaster of Paris. The needle may be thoroughly flamed without danger of breaking.

FRIDAY, JANUARY 2

Immunity

On the Value of a New Skin Test for Diagnosis of Tuberculosis: DR. J. BRONFENBRENNER.

In the work reported to this society last year by Dr. Manwaring and myself[1] and subsequently continued and published in the *Journal of Experimental Medicine*,[2] it was shown that tuberculous guinea-pigs acquire the power of reducing the number of tubercle bacilli injected into their peritoneal cavity; that certain fixed cells of the peritoneal cavity were apparently responsible for this phenomenon, as even removed from the body of the guinea-pig the isolated peritoneal tissues of tuberculosis animals had the power of reducing the number of tubercle bacilli placed in contact with them; that, however, as far as our experiments went the intraperitoneal destruction of tubercle bacilli in tuberculous animals was not caused by circulating antibody. It was thought, however, worth while to investigate what changes the blood of these guinea-pigs underwent in the conditions of the experiment, as it seemed improbable that the cells of the peritoneal cavity could have acquired immune properties without these being present in the blood. A series of experiments was undertaken to test complement deviation on the blood of tuberculous animals, but the results obtained varied with the different strains of tubercle bacillus used as antigen. In general, however, experiments showed that the blood of guinea-pigs often contains specific antibody against tuberculous antigen. Having established this fact, an attempt was made to see if this antibody is of the nature of a bacteriolysin. The series of experiments were performed both in vitro and in vivo. In the course of this last series of experiments a very interesting phenomenon was noticed, namely: that if a normal guinea-pig was injected intraperitoneally with a mixture of the serum of a tuberculous guinea-pig with the peritoneal exudate resulting from the injection of a small amount (10,000) of tubercle bacilli in the peritoneal cavity of another highly immunized guinea-pig, often a local reaction would result on the spot of inoculation, followed by a rise of temperature. This local reaction was especially pronounced in the cases where the peritoneal wall was punctured several times for the purpose of removing a sample of the exudate, and in this way probably a part of the mixture was introduced from within the peritoneal cavity under the skin of the animal. In analyzing this phenomenon it was found that the peritoneal exudate employed in these experiments could be conveniently replaced by a crude tuberculin as prepared by the Board of Health of New York, but not very well by a suspension of washed tubercle bacilli. The non-washed (possibly partly autolyzed) suspension of tubercle bacilli, especially if not freshly prepared, could also be used successfully. Since then, a number of tests were performed in which guinea-pig serum was replaced by the serum of tuberculous patients, and it was found that the reaction, although not very constant, is of a prognostic value in tuberculosis.

While the work is still in progress, the experiments performed up to date seem to show that the complement is an important factor in the phenomenon, inasmuch as heated sera failed to give this reaction, yet if activated by the addition of a complement and left at room temperature for a

[1] *Centrbl. f. Bact. Ref.*, Bd. 59, No. 12, p. 371.

[2] *Jour. of Exp. Med.*, 1913, Vol. XVIII., No. 6, p. 601.

short time, they could be reactivated. Whether the reaction is due to the liberation of an anaphilatoxin from the mixture of the serum containing the toxogenin and complement with the antigen of the tuberculin, is a question to be decided in the experiments which are to follow. At present I wish to call attention to this phenomenon as a possible method for the diagnosis of tuberculosis at least in cases where the condition is not too far advanced and where there is some of the free antibody in the circulating blood.

Subcutaneous injection 0.55 c.c. of a mixture of fresh blood of patients suffering from tuberculosis (1 c.c.) with tuberculin (crude diluted 1 to 10 0.1 c.c.) into a normal guinea-pig causes a local reaction similar in its aspect to a tuberculin reaction which is of good prognostic value in diagnosis of tuberculosis.

The Relationship of Anaphylaxis to Immunity: Fraser B. Gurd.

The experiments reported in this paper were undertaken in the hope of procuring data which might throw light upon the fact, now well established, that in order that an animal may become "immune" to a complex proteid, such as serum albumin, it is necessary that the animal first become, potentially at least, anaphylactic.

The author believes that there is not sufficient evidence upon which to base the theory of sessile and free receptors, as suggested by Friedberger and recently actively championed by Weil. That the reaction of the body to the parenteral introduction of foreign proteins is an exhibition of the property of parenteral digestion, is well established, as indicated by the work of Alberhalden, Zunz, Friedberger and others. That at one stage in the process of protein cleavage a highly poisonous split product is produced, is also proven, and that it is on account of the elaboration of ferments or lysins, capable of producing cleavage of the injected protein with the liberation of this toxic product, that the anaphylactic state is developed, appears sufficiently well supported by numerous experiments. The author desires to suggest that the immunity to or tolerance of heterologous protein introduction is due to the tissues of the repeatedly injected animal acquiring the property of elaborating a second order of lysins which are potent to produce more complete cleavage of the toxic split-protein products. Thus it is due to the presence in the body fluids and tissues of two orders of lysins, that the "immune" animal is itself protected against the harmful effects of protein injection, even though its serum is potent to passively sensitize normal animals.

The author's experiments prove that it is possible, by varying the quantity of transferred serum injected, to render normal animals either highly sensitive or "immune." Thus, two guinea-pigs which received (intravenously) .6 c.c. of serum from an immune rabbit were found to be sensitive (at the end of 24 hours), to 5 and 6 minims of sheep's serum, the latter with a fatal termination; whereas a rabbit which received 4.0 and 4.5 c.c. of the same rabbit serum on two successive days, and 24 hours later was injected with 7 minims of sheep's serum, was found to be immune.

In another series of experiments the toxic injections were carried out immediately following the injection (intravenous) of the transferred serum. In these experiments it was found that whereas 0.5 c.c. of rabbit's serum rendered a normal pig highly anaphylactic (dyspnea and convulsions), the injection of 2.75 c.c. was sufficient to induce a complete tolerance to the toxic injection of the protein.

Study of the Bacteriology of the Posterior Nasopharynx in Scarlatina: N. S. Ferry, M.D.

The study of the bacteriology of the posterior nasopharynx in scarlatina was undertaken by the writer to isolate, if possible and determine the rôle of a certain micrococcus found in this region and briefly described by Dr. Schultze in a preliminary report in the *Medical Record,* New York, December 10, 1910. This organism was seen by Dr. Schultze in smears from 459 out of 555 cultures taken from the throats of patients suffering with typical symptoms of the disease. The greatest number of positive findings have been obtained by swabbing the posterior pharyngeal wall and allowing the swab to stand in a test tube of bouillon a few hours. The entire amount of bouillon is then plated in the usual manner. The organism was not isolated in the later stages of the disease and was not found in any of the purulent discharges nor the blood, which seems very significant considering the fact that it appears to coincide with the contention of the majority of observers that the disease is contagious only in its early stages. For convenience in nomenclature this organism was called by the writer Micrococcus "S" and, for the present, it will continue to be designated by that term.

The Mic. "S" is a large coccus usually found in pairs and often tetrads which grows luxuriantly on all culture media after the first few generations. Whether the Mic. "S" has or has not any spe-

cific clinical or pathological significance, for the purpose of placing it on record, a detailed description of the organism will be given, followed by a brief review of the experimental work carried out with it.

Morphology.—Mic. "S" is a large, clearly defined, biscuit-shaped diplococcus, sometimes appearing in tetrads, measuring about the size of the meningococcus and gonococcus. It is non-spore-bearing, non-motile, non-capsulated, stains deeply with all aniline dyes and is positive to Gram.

Cultural Reactions

Agar Slant.—Abundant, smooth, grayish-white, glistening, opaque, filiform or slightly beaded raised growth, becoming somewhat viscid within a few days.

Agar Deep.—Abundant, filiform, growth usually in one plane, with a slightly spreading surface growth.

Agar Colony.—Slow-growing, round, smooth, convex, entire, coarsely granular colony.

Bouillon.—Slight growth, clear with sediment.

Potato.—Very slight, colorless growth.

Litmus Milk.—No change.

Koch's Serum.—Slight, filiform, white growth.

Loeffler's Serum.—Abundant, filiform, smooth, glistening, pinkish white growth.

Gelatin Stab.—Gradual stratiform liquefaction. In about five days a cup forms at the surface and as liquefaction increases it reaches the sides of the tube and then proceeds downwards. At the end of six weeks, the medium is liquefied about half way down.

Indol negative.

Litmus Sugars.—Glucose, maltose and saccharose gave an acid reaction; galactose, levulose and lactose, no change.

Pathogenic Powers

While extensive inoculation experiments were carried out with this organism, nothing of any special specific significance could be gleaned from the work. Whether the organism soon loses its virulence on artificial culture media, or whether it is devoid of all pathogenic properties for the animals used, is a question which was undecided. Believing, nevertheless, that this organism was found in a large enough proportion of cases to warrant further work, irrespective of the apparently negative pathogenicity, several vaccines were prepared with it which have been fairly tested out, both prophylactically and therapeutically under the supervision of Dr. Schultze in New York and Dr. Kiefer in Detroit, which work will be reported in later communications by them.

Other observers have, from time to time, noted the presence of a large diplococcus in cultures and smears from the throats of scarlatina cases, and yet no one has succeeded in proving that it has any part to play in the disease and, therefore, very little stress has been laid on the findings. The organism described by these writers is so varied in its morphology and cultural characteristics that one is inclined to one of two suppositions. Either it is extremely polymorphous, as was claimed by Class, or else they were dealing with cultures containing streptococci, which organisms may often be seen, in smears from the throat directly or from cultures, as large diplococci.

From the experience of the writer with the organism he has isolated and named Mic. "S," which tallies with the general descriptions given by Schultze, Class and others, as seen in smears it is quite essential not only to plate the cultures, but to be absolutely certain that the colonies from which the cultures are taken have no small colonies of streptococci, either deep or superficial, adjacent to or near them. This can only be ascertained by examining the field with a lens. Among the several known organisms found in the throat, from which the Mic. "S" should be differentiated, the following are the most important.

Mic. catarrhalis.
Mic. tetragenus.
Mic. pharyngis siccus.
Dip. intracellularis meningitidis.

Studies in Avian Tuberculosis: L. R. HIMMELBERGER.

Cultures of the avian tubercle bacilli were grown on sterile banana and glycerinated slants of carrots, turnips and garden beets. The different character of the growths obtained on the different media, would suggest the use of these vegetables as differentiating media. Attempts were made to infect white rats, under conditions simulating cohabitation with tuberculous chickens and guinea-pigs and rabbits by injection of pure cultures subcutaneously and intravenously (in rabbits) without success. Two calves were infected by the ingestion of mascerated tubercular organs of chickens while in one an attempt at infection by ingestion was unsuccessful. The calves were tuberculin tested previous to infection and came from a cow which had given no actions to the tuberculin test, and were fed from a herd free from tuberculosis as indicated by repeated tuberculin tests. The calves which were infected gave reactions to tuberculin prepared from the avian organisms and on autopsy lesions of tuberculosis were found. It is regrettable that we were not able to isolate this organism. The agglutination test was tried on a limited number of birds both normal and diseased. In only

one case did a normal bird (as shown by macroscopical examination at autopsy) exhibit an agglutination titre over 1:50 and this bird had been subjected to infection. All of the birds showing lesions on post-mortem examination gave a titre as high as 1:100.

JANUARY 2, 1914

Pathology

A Comparative Study of the Intestinal Flora of White Rats Kept on Experimental and on Ordinary Mixed Diets: LEO F. RETTGER AND GEORGE D. HORTON.

The investigation extended over a period of almost one year, and was carried on in connection with the pure protein nutrition experiments of Osborne and Mendel. The feces of 22 rats were examined, 17 of the rats receiving the experimental diets consisting essentially of purified animal or vegetable protein, protein-free milk, starch and lard. The remaining 5 rats received ordinary mixed food consisting of sunflower seeds, carrots, dog-bread, meat, etc.

A change in the intestinal flora became apparent very soon after the rats were transferred from the ordinary to the special diets. The flora became more simplified, very few types being found after the first three or four days, as a rule. An increase in the number of Gram-positive organisms from 35–50 per cent. to 85–100 per cent. was frequently observed. There was no appreciable difference in the results, in so far as the individual proteins were concerned, with the exception of Zein. Although they were present in the feces of the stock-room rats in relatively large numbers, two organisms which are a part of, or closely related to, the acidophilus group of bacteria, were frequently present to the exclusion of all other types, except *Bacillus bifidus* of Tissier and *B. coli*, *B. bifidus* was much more abundant in the experimental rats than in those receiving the usual diet, while the number of *B. coli* was greatly reduced. No definite relationship could be established between the bodily conditions (growth, vigor, etc.) of the rats receiving the special diets, and the intestinal flora.

Anaerobic Culture of Coccidiodes Immitis: WARD J. MACNEAL AND RICHARD M. TAYLOR, M.D.

Two strains of *Coccidioides immitis* of Rixford and Gilchrist[3] have been studied, one derived from a fatal case of generalized infection which occurred in the practise of Dr. Chas. A. Powers, of Denver, and which has been studied by Whitman,[4] and a second isolated at this laboratory[5] from a similar case which occurred in the practise of Dr. Robt. T. Morris, of New York. We observed the metamorphosis of the spherical (Coccidioidal) bodies into typical mycelial growth on agar and the inverse change of the threads back into spherical bodies in the animal body. Finally by inoculating the spherical bodies into tubes of ascitic fluid containing bits of sterile animal tissue, or better, tubes of gelatinized horse serum, and covering these with paraffin oil or incubating in an atmosphere of hydrogen, we succeeded in obtaining abundant multiplication of the spherical form *in vitro*. The forms of the organism in these cultures resemble very closely those seen in diseased tissues.

Further Observations of the Thompson-McFadden Pellagra Commission upon the Etiology of Pellagra: J. F. SILER, P. E. GARRISON AND W. J. MACNEAL.

Information concerning the age and sex, occupations, location of domicile, general dietary habits, and concerning the existence of pellagra was obtained upon about five thousand persons by a house-to-house canvass of six cotton-mill villages. A similar study was carried out in one rural district of four square miles in which several cases of pellagra had occurred. Many other communities were studied in less detail. There was no definite relation observed between the occurrence of pellagra and the use of any particular foods. New cases developed for the most part in the immediate vicinity of old cases or after close association with them. In districts completely equipped with water-carriage systems of sewage disposal, we found pellagrins who had acquired the disease before moving to these districts. Cases apparently originating in these sewered districts were extremely rare and their origin there somewhat doubtful. These observations strongly suggest that unsanitary methods of sewage disposal have an important relationship to the spread of pellagra. If these indications can be confirmed in other places, we feel that the proper correction of these conditions by the installation of water-carriage systems of sew-

[3] Rixford, Emmet, and Gilchrist, T. C., "Two Cases of Protozoon (Coccidioidal) Infection of the Skin and Other Organs," Johns Hopkins Hospital Reports, 1896, Vol. I., p. 209–290.

[4] Whitman, R. C., "A Contribution to the Botany of the Organism of Blastomycosis," *Jour. of Infectious Diseases*, July, 1913, Vol. XIII., pp. 85–95.

[5] MacNeal, W. J., and Hjelm, C. E., "Note on a Mold, *Coccidioides immitis*, Found in a Case of Generalized Infection in Man," *Jour. Amer. Med. Assoc.*, December 6, 1913, Vol. LXI., No. 23, p. 2044.

age disposal will go far toward restricting the spread of the disease. The exact mode of transmission of pellagra is still uncertain and we strongly urge the continued study of food contamination, of insects as transmitting agents and of close personal association as possible factors in its spread.

Further Studies with Reference to Spirochæta suis: WALTER E. KING, RAYMOND H. DRAKE AND G. L. HOFFMAN.

This report gives in detail the results of the study of the flora of the crypts in the ceca, intestinal ulcers and the external local lesions of a number of normal, immune and diseased hogs, with reference to the presence of *Spirochæta suis*. The study includes the examination of 234 cases by means of the dark field. Of these, positive findings have been made in 171 cases, negative findings in 63 cases. Of the latter, 38 cases were hogs immune to cholera, 2 were animals susceptible but not exposed to hog cholera, 3 with typical hog cholera but treated with toxic doses of mercuric or arsenical preparations, 16 in which the organism was found either in local lesions or in the crypts and ulcers of the intestines, and 6 cases resulting in negative control findings. In 5 hogs which were made immune to cholera, *Spirochæta suis* was found in the crypts of their ceca at intervals of from 10 days to 11 weeks after exposure.

These data, together with results already reported, warrant the tentative deduction of the following conclusions: (1) In the ulcerated areas of cecal mucosa and in the crypts, near the ileo-cecal valve, of hogs dead from cholera, is localized a constant species of spirochete, *Spirochæta suis*. Experimental evidence shows that this organism is pathogenic for swine and that it plays an important part in the production of hog cholera. (2) The crypts in the ceca of activity immunized hogs may sometimes contain *Spirochæta suis* for a variable period of time after immunization. (3) *Spirochæta suis* becomes localized in the necrotic tissue or purulent exudate of the external lesions, which are sometimes present in cases of typical hog cholera, especially of the subacute chronic types.

The Relation of Lavatory Appliances to the Spread of Intestinal Infections: B. R. RICKARDS AND L. B. CLORE.

These experiments were carried out to determine the rôle played by the chain pull and other appliances of the toilet room in transmitting from hand to hand typhoid bacilli and other organisms capable of causing intestinal disorders. The surfaces tested were rubbed with sterile cotton swabs previously moistened with sterile water. Plates made by rubbing the swabs over the surface of Endos medium in Petri dishes. The plates were incubated for 48 hours at 37° C. and inoculations into plain broth were then made from a number of each of the various kinds of colonies found, attention being centered on those cultures having a typical *Bacillus coli* appearance. The work was confined entirely to the detection of the colon group, lack of time preventing experiments being carried on for the presence of *B. ærogenes capsulatus*. The broth cultures were examined microscopically after 48 hours' incubation and transplants made into Hiss's semi-solid media. These tests were carried out on media containing, respectively, dextrose, lactose, saccharose and mannit. Typical growth on all four media was taken to mean that the organism isolated was a member of the typhoid-colon group.

In each instance swabs were taken from the front of the seat, back of the seat, door knob and from the handle of the device operating the flushing tank. From the low flush tank type, cultures were made from the metal or porcelain lever. If, of the high box type, the swab inoculation was made from the metal or porcelain handle and oftentimes from the lower parts of the chain, the object of the latter being to see if there was any attempt by the users of the closets to avoid infection by putting the hands on that part of the apparatus not commonly used. For the same reason swabs were in all cases taken from portions of the door with which the hand might come in contact in case the handle of the door was avoided.

B. coli was isolated in pure culture from swabs taken from the following locations. (1) From the seat in two different toilets of the scientific department of the manufacturing establishment. In one case tests were made at three different times and *B. coli* found each time. (2) From four different seats in the public comfort station. In no case was *B. coli* detected on the handles of pull or push levers nor on the chains, nor was this organism detected on the metal or porcelain door handles or upon the wood of the door.

While the results by experiments fail to show presence of *B. coli* on any other surfaces except on the wooden seat, we still feel that there is a possibility that the handles of flushing devices may at times serve as a means of carrying typhoid or other intestinal infection or possibly gonorrhea or syphilis from hand to hand, at short intervals and that foot or automatic levers should take their places.

The Malarial Parasites: Mary R. Lawson, M.D.

Many of the misconceptions in regard to the morphology and biology of the malarial parasites are due to the fact that the majority of observers have believed them to be intracellular, and that each parasite grew up and completed its life cycle within a single corpuscle, the segmentation of the parasite corresponding to the final destruction of the corpuscle. The writer believes the parasites to be extracellular throughout their existence, that is, when not in migration, they attach themselves to the external surface of the red corpuscles by means of protoplasmic pseudopodia surrounding mounds of corpuscular substance, which the parasite has "squeezed up" for the purpose of attachment. This interpretation is confirmed by seeing the corpuscular mounds at the periphery of the red corpuscles encircled by the pseudopodia of the parasites.

The evidence in favor of migration is:

1. The destruction of red corpuscles is usually out of all proportion to the number of parasites present, providing one parasite destroys but one corpuscle.
2. In multiple infection of red corpuscles by several young parasites, they can not all grow up on one corpuscle, therefore they must migrate or die.
3. Stages of parasitic migration such as (*a*) Free pigmented parasites, compact, amœboid, with pseudopodia. (*b*) Pigmented parasites attached to apparently healthy corpuscles. (*c*) Pigmented parasites (24 hr.) apparently in the act of abandoning degenerated corpuscles. (*d*) Parasites on corpuscular skeletons. (*e*) Corpuscular skeletons which are expanded remnants of red corpuscles which have been dehemoglobinized.

The sexual cycle takes place in the blood of man in the various malarial infections. The flagella are always derived from the chromatin substance, and from the chromatin alone. In the æstivo-autumnal infections the writer has observed but one flagellum to each crescent, while in the tertian and quartan infections, there are several flagella to each parasite.

A Preliminary Communication on the Etiology of Pyæmic Arthritis in Foals: Frank W. Schofield.

The author after a brief discussion relative to modes of infections points out that intrauterine infection of foal can alone account for some cases, and most probably does for more than is generally believed. The bacteriology of the disease is reviewed and author's findings given. An organism of the colon typhoid group has been recovered uncontaminated from blood and joints in early stages of disease. The relationship of this organism to the disease was established by complement fixation tests using foals' blood and organism isolated as antigen. Positive fixation tests were also obtained from the blood of dams that have delivered foals which subsequently became diseased.

Experiments Bearing on Pulmonary Infection: Frank W. Schofield.

Mention is made of two existing views regarding pulmonary infection. That it is due to direct inhalation of course into smaller air passages, or arises as the result of a primary infection of blood stream. The difficulty of infecting the lung by direct inhalation was demonstrated by experiments of following nature.

First Experiment.—Horses were exposed to a very fine spray from powder atomizer, the material used being equal parts gentian violet and powdered charcoal. After a few minutes' spraying the atmosphere became saturated with this fine violet powder. Horses breathing normally filtered all the powder out of the inspired air before same reached trachea. When excessive, labored and rapid breathing was induced the powder could be detected in the larger bronchi.

Second Series of Experiments.—A spray of *B. prodigiosus* was here substituted for the powder. The spray was manipulated so that the fine terminal portion of the same enveloped the nostrils of animals breathing it. The spray was kept up for several minutes. In most cases the organism could not be recovered past the larynx. When present in the trachea bacilli were few in numbers. The last experiment consisted of taking a number of swabs from the trachea of normal horses, cattle, sheep. In most cases the tracheæ were found to be sterile. When the organ was infected the organisms were *S. aureus, S. albus* and *Streptococci.* None of the common organisms present in the air these animals were breathing were recovered from the trachea.

Conclusions.—In health the trachea if not sterile has no constant bacterial flora. This could not be so if dust with bacteria could easily pass the nasopharynx.

That with nasal breathing most of the bacteria inhaled are removed before the air enters the trachea, even when the atmosphere is saturated with bacteria.

That direct infection of lung through nasal inspiration is almost impossible, under ordinary conditions.

A. Parker Hitchens,
Secretary